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For related information see also *Astronautics*.

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84 LAW AND POLITICAL SCIENCE **N.A.**
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION **1406**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **1406**

89 ASTRONOMY **1407**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1414**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1416**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1416**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1418**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1418**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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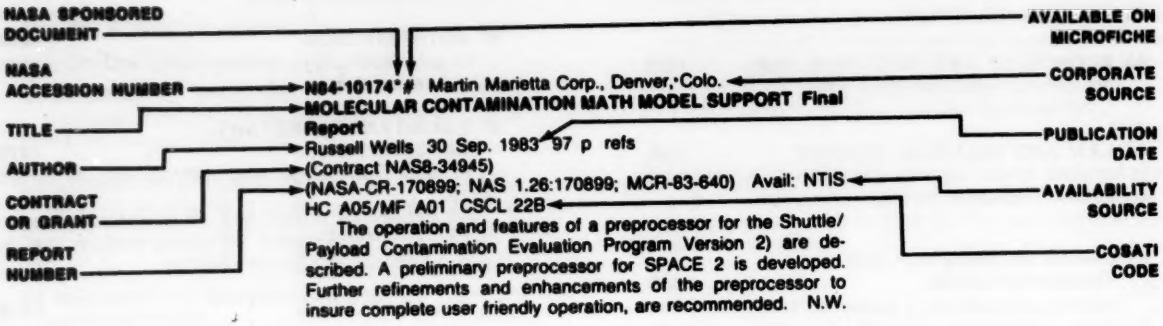
TYPICAL CITATION AND ABSTRACT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N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 9/MAY 8, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-18153*# National Aeronautics and Space Administration, Washington, D. C.
THE CONCORDE AND AERONAUTICAL RESEARCH
M. Salmon Aug. 1983 35 p refs Transl. into ENGLISH from L'Aeron. et L'Astronautique (France), no. 11, 1969 p 7-20 Original language document was announced as A69-33380 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76973; NAS 1.15:76973) Avail: NTIS HC A03/MF A01 CSCL 01B

Theoretical and experimental work carried out in various research centers, and particularly at ONERA, which led to the conception and to the main technical solutions included in the design of Concorde: plane form, twist and camber of the wing, lift augmentation by upper surface vortices, kinetic heating, air intakes and jet exhausts, materials, aeroelasticity. The development of research, and the numerous tests carried out for the benefit of the designers since the beginning of the project, are also outlined. Author

N84-18154*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRFRAME TECHNOLOGY FOR AIRCRAFT ENERGY EFFICIENCY
Robert L. James, Jr. and Dal V. Maddalon Mar. 1984 26 p refs
(NASA-TM-85749; NAS 1.15:85749) Avail: NTIS HC A03/MF A01 CSCL 01B

The economic factors that resulted in the implementation of the aircraft energy efficiency program (ACEE) are reviewed and airframe technology elements including content, progress, applications, and future direction are discussed. The program includes the development of laminar flow systems, advanced aerodynamics, active controls, and composite structures. A.R.H.

N84-18155# Stanford Univ., Calif.
CENTER OF EXCELLENCE IN AEROSPACE MANUFACTURING AUTOMATION Annual Report, No. 1, Aug. 1982 - Sep. 1983
R. H. Cannon, Jr., T. O. Binford, J. D. Meindl, and R. Brooks Nov. 1983 117 p Original contains color illustrations
(Contract F49620-82-C-0092; AF Proj. 2306)
(AD-A136477; SPO-13649-01-00; AFOSR-83-1203TR) Avail: NTIS HC A06/MF A01 CSCL 13/8

Air Force support of a Center of Excellence at Stanford University has provided the impetus and core for a major new entity, the Center for Automation and Manufacturing Science (CAMS). The new center draws from two well-known research groups at Stanford: the Robotics Group of Stanford's Artificial Intelligence Laboratory and the Automatic Control Group of Stanford's Department of Aeronautics and Astronautics. Ten professors and some 50 graduate students are participating in CAMS activities. CAMS in turn is the first of a new complex of centers at Stanford involved in the manufacturing enterprise: the Stanford Institute for Manufacturing and Automation (SIMA). Strong industrial interaction is a primary objective of SIMA. In our Air Force program we are focusing on robotic aspects of automation. Our goal is to make fundamental contributions to the underlying set of technologies that will enable the next generation of industrial robots to be far more capable than today's - will enable them to be lightweight, limber, deft, facile, quick, friendly, low-powered, seeing, sensing, thinking machines that can reason and strategize-can carry out tasks assigned at a high conceptual level. Specifically, our research focus is on fast, precise control of lightweight (flexible) manipulators, sensing, especially optical and tactile sensing, intelligent systems for robot task management, and computer vision for robot management. We are addressing the question of how to provide manipulator control so good that a whole new generation of manipulators can be developed-manipulators that are much lighter and far more facile than anything today's control systems could stably manage. GRA

N84-18156# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
PREVENTIVE MAINTENANCE INTERVALS FOR COMPONENTS OF THE F-15/F100 AIRCRAFT ENGINE M.S. Thesis
J. R. Brill Sep. 1983 144 p
(AD-A135637; AFIT-LSSR-93-83) Avail: NTIS HC A07/MF A01 CSCL 21/5

Costs of maintenance can be reduced for many engine components by replacement before failure. This has been one objective of the Air Force Reliability Centered Maintenance (RCM) program. The key to realizing cost savings is optimization of the replacement or inspection interval. Graphic solution techniques show promise as a simple, consistent, and valid method of interval determination. They are based on use of actual age-at-failure data and cost data for individual parts of an engine, such as fuel pump of rotor disc. This study illustrates a graphic method of determining their replacement intervals, using five components of the F100/F-15 aircraft engine as a case study. The resultant optimum intervals and expected costs differ up to 50% from methods where actual costs and actual ages at failure are not used. Graphic analysis is a quick method responsive to system changes, but depends on use of representative age at failure data. This study verifies a basic technique. Existing methods can be used to aggregate the set of intervals into an engine maintenance plan. Author (GRA)

N84-18157# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBING INTO THE SECRET OF THE CHINESE AIR FORCE
30 Nov. 1983 114 p Transl. into ENGLISH of Enclosure to IR-6-842-0088-83 booklet: Inside the Plaaf (China) p 1-44
(AD-A135960; FTD-ID(RS)T-1089-83) Avail: NTIS HC A06/MF A01 CSCL 15/3

An assessment of China's aircraft industry is given. The effectiveness of China's airforce is discussed. Several of China's fighter aircraft are discussed. R.J.F.

N84-18158# Management Consulting and Research, Inc., Falls Church, Va.
US MILITARY AIRCRAFT COST HANDBOOK Final Technical Report
William E. DePuy, Jr., Rosemarie Moyer, Paul R. Palmer, Jr., Bruce J. McKinney, George R. Kreisel, Stephen J. Balut, and Gerald R. McNichols 1 Mar. 1983 507 p Prepared for The Analytic Sciences Corp.
(Contract MDA903-78-C-0294)
(AD-A136035; TASC-TR-8203-1) Avail: NTIS HC A22/MF A01 CSCL 01/3

Management Consulting & Research, Inc. (MCR) collected data on the Total Obligational Authority (TOA) requested by the Army, Navy and Air Force to procure attack, bomber and fighter, fixed and rotary wing aircraft. The TOA was normalized to base fiscal year 1981 dollars. Lot average, cumulate average and unit costs were calculated for Airframe, Airframe and Engine on total flyaway cost where available. Data is presented for 128 Mission/Design/Series (MDS) aircraft. Author (GRA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-18159*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRFOIL INTERACTION WITH IMPINGING VORTEX
K. W. McAlister and C. Tung Feb. 1984 86 p refs Prepared in cooperation with Army Aviation Systems Command, St. Louis, Mo.
(NASA-TP-2273; E-1585; NAS 1.60:2273; AVSCOM-TR-83-A-17) Avail: NTIS HC A03/MF A01 CSCL 01A

The tip of a finite-span airfoil was used to generate a streamwise vortical flow, the strength of which could be varied by changing the incidence of the airfoil. The vortex that was generated traveled downstream and interacted with a second airfoil on which measurements of lift, drag, and pitching moment were made. The flow field, including the vortex core, was visualized in order to study the structural alterations to the vortex resulting from various levels of encounter with the downstream airfoil. These observations were also used to evaluate the accuracy of a theoretical model. Author

N84-18160# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
AN APPROACH TO THE DESIGN OF AIRFOILS WITH HIGH LIFT TO DRAG RATIOS
David Walter Zingg Nov. 1983 69 p refs
(UTIAS-TN-245; ISSN-0082-5263) Avail: NTIS HC A04/MF A01

A procedure for the design of low-speed, single-element airfoils with high lift to drag ratios is presented. The procedure uses an inverse approach which proceeds from a set of desirable boundary layer characteristics, which are determined from the performance objectives, to a velocity distribution and, finally, to an airfoil shape. The boundary layer shape factor, which is a measure of the nearness of the boundary layer to separation, is used to define the boundary layer characteristics in the upper surface pressure recovery region. The turbulent boundary layer equations are solved in inverted form to calculate the velocity distribution which corresponds to a shape factor variation. The velocities on the upper surface prior to pressure recovery are chosen to cause boundary layer transition at a desired location. The lower surface velocity distribution is selected to satisfy the requirement that a closed, non-reentrant shape which meets the specified structural requirements results. The design procedure described can be utilized for the design of high performance airfoils for a variety of performance objectives, operating conditions, and practical constraints. Using this procedure, an airfoil was designed which achieves a lift to drag ratio of 180 at a lift coefficient of 1.2 and a Reynolds number of one million. Through this design study, a set of guidelines for the design of airfoils with high lift to drag ratios is established. Author

N84-18161*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC DESIGN FOR IMPROVED MANUEVERABILITY BY USE OF THREE-DIMENSIONAL TRANSONIC THEORY
Michael J. Mann, Richard L. Campbell, and James C. Ferris Feb. 1984 72 p refs
(NASA-TP-2282; L-15681; NAS 1.60:2282) Avail: NTIS HC A04/MF A01 CSCL 01A

Improvements in transonic maneuver performance by the use of three-dimensional transonic theory and a transonic design procedure were examined. The FLO-27 code of Jameson and Caughey was used to design a new wing for a fighter configuration with lower drag at transonic maneuver conditions. The wing airfoil sections were altered to reduce the upper-surface shock strength by means of a design procedure which is based on the iterative application of the FLO-27 code. The plan form of the fighter configuration was fixed and had a leading edge sweep of 45 deg and an aspect ratio of 3.28. Wind-tunnel tests were conducted on this configuration at Mach numbers from 0.60 to 0.95 and angles of attack from -2 deg to 17 deg. The transonic maneuver performance of this configuration was evaluated by comparison with a wing designed by empirical methods and a wing designed primarily by two-dimensional transonic theory. The configuration designed by the use of FLO-27 had the same or lower drag than the empirical wing and, for some conditions, lower drag than the two-dimensional design. From some maneuver conditions, the drag of the two-dimensional design was somewhat lower. Author

N84-18162*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EXPERIMENTAL INVESTIGATION OF NACELLE-PYLON INSTALLATION ON AN UNSWEPT WING AT SUBSONIC AND TRANSONIC SPEEDS
John R. Carlson and William B. Compton, III Feb. 1984 203 p refs
(NASA-TP-2246; L-15589; NAS 1.60:2246) Avail: NTIS HC A10/MF A01 CSCL 01A

A wind tunnel investigation was conducted to determine the aerodynamic interference associated with the installation of a long duct, flow-through nacelle on a straight unswept untapered supercritical wing. Experimental data was obtained for the verification of computational prediction techniques. The model was tested in the 16-Foot Transonic Tunnel at Mach numbers from 0.20 to 0.875 and at angles of attack from about 0 deg to 5 deg. The results of the investigation show that strong viscous and compressibility effects are present at the transonic Mach numbers. Numerical comparisons show that linear theory is adequate for subsonic Mach number flow prediction, but is inadequate for prediction of the extreme flow conditions that exist at the transonic Mach numbers. S.L.

N84-18163*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BODY AND CANARD EFFECTS ON AN ATTACHED-FLOW MANEUVER WING AT MACH 1.62
James L. Pittman, David S. Miller, and William H. Mason (Grumman Aerospace Corp., Bethpage, N.Y.) Feb. 1984 149 p refs
(NASA-TP-2249; L-15677; NAS 1.60:2249) Avail: NTIS HC A07/MF A01 CSCL 01A

A wing-body-canard configuration was tested at a Mach number of 1.62 by using both a cambered and an uncambered wing. The cambered wing was designed to produce efficient high lift by using attached supercritical crossflow and was originally tested as an isolated wing. The uncambered wing has the same planform and essentially the same thickness distribution as the cambered wing. The experiment determined the effects of a body and canards on both wings. The experimental data showed that both the body

and the canards influenced the wing pressure levels, but that the attached supercritical crossflow, which was achieved in the isolated cambered-wing test, was maintained in the presence of a body and canards. Tables of experimental pressure, force, and moment data are included, as well as photographs of oil flow patterns on the upper surface. S.L.

N84-18164*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INVESTIGATION OF TRAILING-EDGE-FLAP, SPANWISE-BLOWING CONCEPTS ON AN ADVANCED FIGHTER CONFIGURATION
John W. Paulson, Jr., P. Frank Quinto, and Daniel W. Banks Mar. 1984 107 p refs
(NASA-TP-2250; L-15627; NAS 1.60:2250) Avail: NTIS HC A06/MF A01 CSCL 01A

The aerodynamic effects of spanwise blowing on the trailing edge flap of an advanced fighter aircraft configuration were determined in the 4 by 7 Meter Tunnel. A series of tests were conducted with variations in spanwise-blowing vector angle, nozzle exit area, nozzle location, thrust coefficient, and flap deflection in order to determine a superior configuration for both an underwing cascade concept and an overwing port concept. This screening phase of the testing was conducted at a nominal approach angle of attack from 12 deg to 16 deg; and then the superior configurations were tested over a more complete angle of attack range from 0 deg to 20 deg at tunnel free stream dynamic pressures from 20 to 40 lbf/sq ft at thrust coefficients from 0 to 2. S.L.

N84-18165*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATIC INTERNAL PERFORMANCE INCLUDING THRUST VECTORING AND REVERSING OF TWO-DIMENSIONAL CONVERGENT-DIVERGENT NOZZLES
Richard J. Re and Laurence D. Leavitt Feb. 1984 111 p refs
(NASA-TP-2253; L-15671; NAS 1.60:2253) Avail: NTIS HC A06/MF A01 CSCL 01A

The effects of geometric design parameters on two dimensional convergent-divergent nozzles were investigated at nozzle pressure ratios up to 12 in the static test facility. Forward flight (dry and afterburning power settings), vectored-thrust (afterburning power setting), and reverse-thrust (dry power setting) nozzles were investigated. The nozzles had thrust vector angles from 0 deg to 20.26 deg, throat aspect ratios of 3.696 to 7.612, throat radii from sharp to 2.738 cm, expansion ratios from 1.089 to 1.797, and various sidewall lengths. The results indicate that unvectored two dimensional convergent-divergent nozzles have static internal performance comparable to axisymmetric nozzles with similar expansion ratios. S.L.

N84-18166# National Aerospace Lab., Tokyo (Japan).
EXPERIMENT OF A SHOCKLESS TRANSONIC AIRFOIL
Masayoshi Nakamura, Koichi Suzuki, Seigo Nakamura, and Masataka Shirai 1983 10 p refs In JAPANESE; ENGLISH summary
(NAL-TR-783; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

An experiment was carried out on the transonic flows over an airfoil which was partially modified from an arbitrary airfoil. The modification was made to satisfy the shockless condition which predicted on NAL TR-602, TR-602T. Static pressures were measured at 88 points on the airfoil surface, when the test Mach number was 0.5-0.8, the test angle of attack was 0 deg - 4 deg and the Reynolds number was 4.0 - 4.6 x 10(6). A shockless transonic flow was observed under a test condition close to the design condition. The supersonic region extends from 0.3% of airfoil chord length and the local maximum Mach number is 1.36. The result of this experiment supports the artificial flow method for obtaining shockless transonic airfoils which are partially modified from an arbitrary airfoil. Author

N84-18167# National Aerospace Lab., Tokyo (Japan).
CALCULATION OF THREE-DIMENSIONAL FLYING OBJECT IN SHOCKLESS TRANSONIC FLOW
Masayoshi Nakamura 1983 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-782; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The artificial flow method for obtaining shockless transonic airfoils which are partially modified from an arbitrary airfoil is extended to cover three-dimensional flows. In order to confirm the extended three dimensional artificial flow method, a numerical simulation of a quasi-aircraft is carried out in a physical plane. The quasi-aircraft is made up of a body, a sweepback wing and a tail unit and it has no lift. Under design conditions of a free stream Mach number of 0.87 and an angle of attack of 0 deg the quasi-aircraft is partially modified and a shockless transonic quasi-aircraft is obtained numerically. The potential flow is used and the flow model has the effects of the walls of a wind tunnel. Author

N84-18168# National Aerospace Lab., Tokyo (Japan).
DOUBLET POINT METHOD FOR CALCULATIONS ON OSCILLATORY LIFTING SURFACES. PART 1: SUBSONIC FLOW
Tetsuhiko Ueda 1983 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-781-Pt-1; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A simple method for calculating the unsteady aerodynamic loadings on harmonically oscillating thin wings in subsonic flow was developed. The method is based on a concept of concentrated lift forces. The wing is divided into the element surfaces on which lift distributions are represented by single concentrated lift forces. Since the procedure does not include any quadratures, it is easily applied to calculate the unsteady aerodynamic loadings on complex planform wings even when they have partial span control surfaces. Numerical calculations are carried out for various wing geometries and are compared with other analyses and experiments. Author

N84-18169*# National Aeronautics and Space Administration, Washington, D. C.
REDUCTION OF THE SHOCK WAVE INTENSITY BY MODIFYING THE TRANSONIC BLADE TRAILING EDGE
Piotr Doerffer Jun. 1983 16 p refs Trans. into ENGLISH of rept. No. 82 Inst. Maszyn Przeplywowych, Prace, Poland, 1982 p 3-12 Original language document was announced as A82-47175 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77029; NAS 1.15:77029) Avail: NTIS HC A02/MF A01 CSCL 01A

It is shown that the shock wave intensity can be decreased by using modified trailing edge configurations to reduce or even completely compensate for the effect of the finite thickness of the trailing edge. A theoretical analysis is presented together with numerical results for two supersonic streams flowing off the trailing edge at different velocities. The analysis is based on an ideal gas model. V.L.

N84-18170*# National Aeronautics and Space Administration, Washington, D. C.
AIR INTAKES FOR A PROBATIVE MISSILE OF ROCKET RAMJET
G. Laruelle Jan. 1984 33 p refs Transl. into ENGLISH from L'Aeron. et L'Astronautique (France), no. 98, 1983 p 47-59 Original language document was announced as A83-31824 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77407; NAS 1.15:77407) Avail: NTIS HC A03/MF A01 CSCL 01A

The methods employed to test air intakes for a supersonic guided ramjet powered missile being tested by ONERA are described. Both flight tests and wind tunnel tests were performed on instrumented rockets to verify the designs. Consideration as given to the number of intakes, with the goal of delivering the maximum pressure to the engine. The S2, S4, and S5 wind tunnels were operated at Mach nos. 1.5-3 for the tests, which were compartmentalized into fuselage-intake interaction, optimization of

the intake shapes, and the intake performance. Tests were performed on the length and form of the ogive, the presence of grooves, the height of traps in the boundary layer, the types and number of intakes and the lengths and forms of diffusers. Attention was also given to the effects of sideslip, effects of the longitudinal and circumferential positions of the intakes were also examined. Near optimum performance was realized during Mach 2.2 test flights of the prototype rockets. M.S.K.

N84-18171*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
A MODIFIED LIFTING LINE THEORY FOR WING-PROPELLER INTERFERENCE Progress Report, 1 Jun. - 30 Sep. 1983
R. K. Prabhu and S. N. Tiwari Nov. 1983 32 p refs
(Contract NCC1-65)
(NASA-CR-173324; NAS 1.26:173324) Avail: NTIS HC A03/MF A01 CSCL 01A

An inviscid incompressible model for the interaction of a wing with a single propeller slipstream is presented. The model allows the perturbation quantities to be potential even though the undisturbed flow is rotational. The governing equations for the spanwise lift distribution are derived and a simple method of solving these is indicated. Spanwise lift and induced drag distribution for two cases are computed. Author

N84-18172# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EXPERIMENTAL INVESTIGATION OF DYNAMIC STALL M.S. Thesis
D. C. Daley Jul. 1983 82 p
(AD-A135846; AFIT/GAE/AA/82D-6) Avail: NTIS HC A05/MF A01 CSCL 20/4

This thesis discusses an experimental investigation of dynamic stall for an NACA 0015 airfoil rotated at different constant angular rates. It describes a microcomputer-based automatic data acquisition system capable of acquiring 1000 items of data per second. When this information was used to predict stall and compared with film-data stall indications of the same test runs, there was excellent correlation between them. Results of the investigation showed a consistent correlation between the stall angle at dynamic conditions and the nondimensionalized angular rate. Experimental data was obtained for non-dimensional angular rates (defined as one half the chord times the angular rate divided by free stream velocity) in the range of .005 to .06. Author (GRA)

N84-18173# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN INVESTIGATION OF THE EFFECTS OF DISCRETE WING TIP JETS ON WAKE VORTEX ROLL UP Ph.D. Thesis - Tennessee Univ.
Fred Thomas Gilliam, Jr. Aug. 1983 150 p
(AD-A135872) Avail: NTIS HC A07/MF A01 CSCL 20/4

A water tunnel experiment and a computational flow field model show that discrete wing tip jets can strongly affect the roll up of the wing tip vortex and apparently decrease its rolled up strength at moderate levels of blowing. The key factor in vortex alleviation was the extent of the local flow interactions between the discrete jets and the developing wing tip vortex. Vortex trajectory in both the spanwise and vertical directions was influenced by the jets. An outboard shift of the wing tip vortex indicated that discrete wing tip jets may be able to produce improved wing aerodynamics during cruise flight. The counterrotating pair of vortices generated by a jet in a cross flow were clearly seen in the water tunnel and appeared to be very effective in reducing the intensity of the wing vortex system. Two types of periodic secondary vortices were also observed in the water tunnel for heavy jet blowing. These were spin-off vortices which periodically developed in the rolling up tip vortex but rapidly spun outboard and above the wing; and entrained vortices which was a set of periodic vortices laterally connecting the wing tip vortex to the vortices embedded in the jet. These secondary vortices are oriented such that they will greatly accelerate the spreading of wake vorticity through the vortex stretching term of the Helmholtz equation. This influence was confirmed in the water tunnel tests. GRA

N84-18174# Dayton Univ., Ohio. Research Inst.
EFFECT OF SUCTION ON THE WAKE STRUCTURE OF A THREE-DIMENSIONAL TURRET Final Report, 1 Dec. 1982 - 17 Aug. 1983
S. C. Purohit Wright-Patterson AFB, Ohio AFWAL Oct. 1983 82 p
(Contract F33615-82-K-3021; AF Proj. 2307)
(AD-A135897; UDR-TR-83-64; AFWAL-TR-83-3099) Avail: NTIS HC A05/MF A01 CSCL 20/4

This report examines the flowfield over a three-dimensional turret when suction is applied to alter the wake structures. At a uniform rate of 0.136 kg/s, the numerical simulation of flow around a turret is accomplished through the solution of mass averaged unsteady compressible Navier-Stokes equations. The computation is performed, for a free stream Mach number 0.6 and Reynolds number 12.8 million/m, on the CRAY-1 computer utilizing 62 x 30 x 30 grid points. Using MacCormack's explicit finite difference scheme, the steady-state periodic solutions are achieved for the two cases when the turret is treated like a solid shell and a porous shell. The results are compared with available experimental data or known solution, and the numerical values for RMS density fluctuations and correlation coefficients are presented. Author (GRA)

N84-18175# Neilsen Engineering and Research, Inc., Mountain View, Calif.
EFFECTS OF BLOWING SPANWISE FROM THE TIPS OF LOW-ASPECT RATIO WINGS OF VARYING TAPER RATIO, WITH APPLICATION TO IMPROVING STOL CAPABILITY OF FIGHTER AIRCRAFT Final Report, 1 Apr. 1982 - 30 Sep. 1982
R. G. Schwind and M. M. Briggs Feb. 1983 93 p
(Contract F49620-82-C-0061; AF Proj. 2307)
(AD-A135688; NEAR-TR-294; AFOSR-83-1045TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

Parametric low-speed wind tunnel testing of several low aspect ratio half-span wings featuring outboard-blowing wing-tip jets has been accomplished. This effort was performed to extend the existing information base regarding lift augmentation of low aspect ratio wings to encompass tapered wings suitable for application to high-performance fighter aircraft. At an angle of attack typical for fighter aircraft takeoff, operation of the wing-tip jets was found to augment the lift coefficient of aspect ratio two wings by 25% to 35%, depending upon the value of the jet momentum coefficient and the wing taper ratio. At low angles of attack, the wing lift coefficients were augmented by as much as 120%, but the amount of lift augmentation decreased in inverse proportion to wing angle of attack. The worth of blowing outboard from the wing tips of fighter aircraft as a means of enhancing STOL performance was assessed. Diverting 70% of the engine bypass airflow to the wing tips reduced predicted takeoff and landing distances by 15%. Differential left-wing-tip-to-right-wing-tip modulation of the jet momentum can immediately produce up to 15,000 ft-lbs of additional roll control torque during low-speed landing approaches. Author (GRA)

N84-18176# Ballistic Research Labs., Aberdeen Proving Ground, Md.
NAVIER-STOKES COMPUTATIONS OF PROJECTILE BASE FLOW AT TRANSONIC SPEEDS WITH AND WITHOUT BASE INJECTION Final Report
Jubaraj Sahu, Charles J. Nietubicz, and J. L. Steger Nov. 1983 39 p
(DA Proj. 1L1-61102-AH-43)
(AD-A135783; AD-F300350; ARBRL-TR-02532) Avail: NTIS HC A03/MF A01 CSCL 19/4

A computational capability has been developed for predicting the flow field about the entire projectile, including the recirculatory base flow, at transonic speeds. Additionally, the computer code allows mass injection at the projectile base and hence is used to show the effects of base bleed on base drag. Computations have

been made for a secant-ogive-cylinder projectile for a series of Mach numbers in the transonic flow regime. Computed results show the qualitative and quantitative nature of base flow with and without base bleed. The reduction in base drag with base bleed is clearly predicted for various mass injection rates and for Mach numbers $.9 < M < 1.2$. The encouraging results obtained indicate that this computational technique may provide useful design guidance for shell with base bleed. GRA

N84-18177# Ballistic Research Labs., Aberdeen Proving Ground, Md.
WIND TUNNEL TESTS ON A NONAXISYMMETRIC PROJECTILE SHAPE AT MACH NUMBERS 2.5 TO 6.0 Final Report
L. D. Kayser Sep. 1983 49 p
(DA Proj. 1L1-62618-AH-80)
(AD-A135784; AD-F300332; ARBRL-MR-03308) Avail: NTIS HC A03/MF A01 CSCL 19/1

Wind tunnel tests on spinning nonaxisymmetric projectile configurations at Mach numbers of 2.5 to 6.0 are reported. The projectile shapes are ogive- cylinder bodies which have been modified by machining three forward facing surfaces and three rearward facing surfaces on the projectile. The machined surfaces are twisted at a rate corresponding to a typical rifling twist. The forward facing surfaces produce a helical or corkscrew type effect and the rearward surfaces form a nonconical boattail and a triangular base. The objective of the test program was to study shapes which have improved stability characteristics which require less gyroscopic stabilization. A more slender, longer L/d projectile can then be flown which has lower drag and shorter time of flight to a moving target. GRA

N84-18178# Naval Surface Weapons Center, White Oak, Md.
HIGH ALTITUDE MANEUVER CONTROL TESTS IN THE NSWC (NAVAL SURFACE WEAPONS CENTER) HYPERVELOCITY WIND TUNNEL
B. D. Prats, M. A. Metzger, and J. A. F. Hill Jan. 1983 30 p
(Z1259)
(AD-A136105; NSWC/MP-83-82) Avail: NTIS HC A03/MF A01 CSCL 20/4

Pressure tests were conducted in the NSWC Hypervelocity Wind Tunnel to obtain aerodynamic data on high-performance missile interceptor vehicles which are controlled by large jets issuing laterally from the vehicle. Reproduction of flight Reynolds number was of particular interest since for large lateral jets extensive separation can occur. The tests were conducted at nominal Reynolds numbers of 2.0, 3.2 and 4.6 million per ft., and at Mach numbers of 10 and 14. Model orientations included angles of attack from -15 to +15 deg and vehicle roll angles of 0, 45 and 90 deg. The tests provided surface pressure distributions over the 112 orifice locations and shock shapes and separation data from the Schlieren photographs. These results constitute an advancement over past tests and provide guidance in calculating jet penetration, jet spreading and separation on high-altitude maneuver control vehicles and in calculating 3-D effects of jets on surface pressure. GRA

N84-18179# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
[AEROSPACE RESEARCH ACTIVITIES] Annual Report, 1982
1983 213 p refs Original contains color illustrations
Avail: NTIS HC A10/MF A01

Research concerning aerospace structural design and testing, aeroelasticity, fracture mechanics, instrumentation, aeroacoustics, fiber reinforced directionally solidified eutectics, powders for turbine component fabrication, and high temperature corrosion and oxidation protection methods is reviewed. Investigations of flow in aerospace power units; wind tunnel test facilities; parallel processing; and numerical and applied aerodynamics programs are described. Author (ESA)

N84-18180# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
DEVELOPMENT OF A COMPUTER CODE FOR 3-DIMENSIONAL HIGHER ORDER PANEL METHOD FOR SUBSONIC POTENTIAL FLOW
Lars-Erik Eriksson 7 Aug. 1983 78 p refs
(Contracts FMV-F-K-82223-78-003-21-001; FMV-F-K-82223-78-170-21-001; FMV-F-K-8223-80-183-21-001)
(FFA-138; ISSN-SW-0081-5640) Avail: NTIS HC A05/MF A01; Aeronautical Research Inst. of Sweden, Stockholm SEK 70

A computer code for the computation of subsonic inviscid flow around wings and wing-body configurations was developed using the boundary integral method. The method is based on independent surface networks with piecewise linear source distributions and piecewise quadratic dipole distributions. The effect of surface curvature is included. Numerical tests and comparisons indicate that the method gives accurate results, which are insensitive to the surface discretization. Author (ESA)

N84-18181# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
UNSTEADY VISCOUS TRANSONIC FLOW COMPUTATIONS USING LTRAN2-NLR CODE COUPLED WITH GREEN'S LAG-ENTRAINMENT METHOD
R. Houwink 22 Nov. 1982 11 p refs Presented at 2nd Symp. on Numerical and Phys. Aspects of Aerodyn. Flows, Long Beach, Calif., 17-20 Jan. 1983 Sponsored by the Netherlands Agency for Aerospace Programs (NIVR)
(NLR-MP-82052-U) Avail: NTIS HC A02/MF A01

Results of unsteady inviscid and viscous transonic flow computations are compared with experimental data for the NACA64A006 airfoil with oscillating flap, for the NACA64A010 airfoil and for a supercritical airfoil oscillating in pitch. The computations were performed using the NLR version of the LTRAN2 computer code, coupled with the Green's lag-entrainment method for a turbulent boundary layer. The computed effect of the boundary layer on the unsteady airloads (reduction of the magnitude and a positive phase shift) leads to a better agreement with experimental data. The remaining differences may be due to the low frequency small perturbation potential approximation, the weak interaction modeling and wall interference effects. Unsteady boundary layer methods and Green's steady method predict similar effects of the boundary layer on the unsteady airloads. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

No abstracts in this category.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-18182 Bundesanstalt fuer Flugsicherung, Frankfurt am Main (West Germany).
[ACTIVITIES REPORT ON AIR TRAFFIC CONTROL IN THE FEDERAL REPUBLIC OF GERMANY] Annual Report, 1982 [JAHRESBERICHT 1982]
1982 36 p In GERMAN
Copyright. Avail: Issuing Activity

Measures for increased air traffic safety; air traffic incidents; navigation and radiophony techniques; information transmission techniques; radar technique; information technique; introduction electronic data handling systems; and television technical services are described. Author (ESA)

N84-18183*# Lockheed-California Co., Burbank.
DEVELOPMENT OF THE L-1011 FOUR-DIMENSIONAL FLIGHT MANAGEMENT SYSTEM Final Report, Sep. 1980 - Jul. 1982
H. P. Lee and M. F. Leffler Washington NASA Feb. 1984 147 p refs
(Contract NAS1-16199)
(NASA-CR-3700; NAS 1.26:3700; LR-30279) Avail: NTIS HC A07/MF A01 CSCL 01C

The development of 4-D guidance and control algorithms for the L-1011 Flight Management System is described. Four-D Flight Management is a concept by which an aircraft's flight is optimized along the 3-D path within the constraints of today's ATC environment, while its arrival time is controlled to fit into the air traffic flow without incurring or causing delays. The methods developed herein were designed to be compatible with the time-based en route metering techniques that were recently developed by the Dallas/Fort Worth and Denver Air Route Traffic Control Centers. The ensuing development of the 4-D guidance algorithms, the necessary control laws and the operational procedures are discussed. Results of computer simulation evaluation of the guidance algorithms and control laws are presented, along with a description of the software development procedures utilized. S.L.

N84-18184# National Aerospace Lab., Tokyo (Japan).
STRAPDOWN INERTIAL GUIDANCE SYSTEM: ONBOARD SOFTWARE AND ITS EVALUATION
Koji Otsubo, Mitsuo Oguchi, Keiji Nitta, and Hidehiko Mori 1983 61 p refs In JAPANESE; ENGLISH summary
(NAL-TR-775; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

An onboard guidance computer must have functions for computing current position, velocity and attitude of the vehicle, so-called navigation computation using outputs from the inertial sensors, and also a function for computing the guidance command to guide the vehicle to an orbit injection point. These computations must be carried on in the real time. An algorithm for a strapdown inertial guidance system which satisfies the requirements is presented. A high accuracy flight trajectory analysis program for satellite launch vehicles was also developed for the purpose of evaluating the performance of the onboard guidance software and it is combined in the evaluation software system. The composition and functions of the evaluation system are summarized. Evaluation results indicating the degree of navigation accuracy are also shown. Processing cycle time of output data from inertial sensors and navigation computation cycle time are given in the ranges from 20 to 2000 milliseconds as evaluation parameters. A.R.H.

N84-18185# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
ESTABLISHMENT AND DISCONTINUANCE CRITERIA FOR PRECISION LANDING SYSTEMS
J. A. Hawkins Sep. 1983 113 p
(AD-A135606; FAA-APO-83-10) Avail: NTIS HC A06/MF A01 CSCL 17/7

This report describes the development of establishment criteria for the standard Microwave Landing System (MLS) with approach lights. The criteria were empirically derived from a benefit/cost analysis. The key elements of the criteria are expressed as a function of (a) annual instrument approaches (AIA's) by user category, (b) non-precision approach minima on the candidate runway, and (c) the probability of IFR weather at the airport. It is estimated that through 1985, the criteria will identify 218 new MLS candidates. Through 1995 the number of potential candidates is expected to reach 324. In addition to these systems, there will be approximately 768 systems in the ILS inventory that will be replaced by an MLS in accordance with guidelines developed in FAA's Microwave Landing System Transition Plan. This represents 1092 (768 + 324) or approximately 1100 systems by 1995. Benefits of an MLS vary widely depending on the proportionate use of the MLS runway, the distribution of instrument weather at the airport, aircraft operating costs, average number of passengers, and other factors. The MLS candidate runways, after first being qualified by regional offices on the basis of establishment criteria published in Airway Planning Standard Number One (APS-1), will then be evaluated by a benefit/cost analysis at FAA Headquarters. GRA

N84-18186# Stanford Univ., Calif.
RESEARCH ON NEW APPROACHES TO OPTICAL SYSTEMS FOR INERTIAL ROTATION SENSING Final Report, 1 May 1982 - 30 Jun. 1983
30 Jun. 1983 77 p
(Contract F49620-82-K-0029; AF Proj. 2305)
(AD-A136045; SU-GL-3622; AFOSR-83-0884TR) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report describes further progress in the development of fiber optic Sagnac loops for inertial rotation sensing (i.e., fiber gyros). The report consists mainly of two sections. The first section describes work on developing a bidirectional optical amplifier for use in fiber optic sensing loops while the second section deals with limits on rotation sensitivity due to fiber scattering and noise statistics of optical sources. GRA

N84-18187# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A REFINED MODEL FOR RADAR HOMING INTERCEPTS
M. J. Tsai and S. D. Weiner 27 Oct. 1983 38 p
(Contract F19628-80-C-0002)
(AD-A136108; TR-657; ESD-TR-83-045) Avail: NTIS HC A03/MF A01 CSCL 17/7

In this report, we extend a simple graphical model for analyzing radar homing interceptor engagements 1 to include the radome refraction error effect and a refined miss distance estimator. The residual radome error is treated as an additive exponentially correlated noise with correlation time equal to the interceptor response time. The miss distance is estimated as the error in predicting the target cross-range position at intercept at the range where the interceptor divert capability becomes just insufficient to correct the distance difference between the previous and the current predicted intercept points. The analytical and numerical results show that the prediction error is a strong function of the correlation time and the effect of correlation generally increases the achieveable miss distance especially when the interceptor response time is large. GRA

N84-18188# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
OPTICAL DATA PROCESSING FOR MISSILE GUIDANCE Interim Report, Sep. 1982 - Sep. 1983
D. Casasent 30 Sep. 1983 117 p
(Grant AF-AFOSR-0091-79; AF Proj. 2305)
(AD-A136216; AFOSR-83-1103TR) Avail: NTIS HC A06/MF A01 CSCL 17/7

Progress on real-time 1-D and 2-D spatial light modulators, optical systolic array processors, optical image processing, and distortion-invariant pattern recognition are reported. Our real-time spatial light modulator research concerns the Soviet PRIZ device and bulk acoustic-optic transducers. Novel features detailed for the Soviet device include: uniform and directional spatial filtering and static image suppression or change detection. Systolic array processor research includes a new frequency-multiplexed architecture, realization of singular value decomposition and matrix decomposition aigorithms. Optical image processing and pattern recognition research received major attention. A new class of nonlinear local operators including the Sobel operator were described and demonstrated. New optical feature generation techniques for distortion-invariant pattern recognition were developed. These include the generalized optical chord transformation. Our primary distortion-invariant pattern recognition research addressed synthetic discriminant functions with attention to two new efficient calculation techniques, the performance of synthetic discriminant functions for multi-class distortion-invariant pattern

recognition, and initial noise performance of this optical pattern recognition algorithm. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-18189*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF MOTION BASE AND g-SEAT CUEING OF SIMULATOR PILOT PERFORMANCE
Billy R. Ashworth, Burnell T. McKissick, and Russell V. Parrish Mar. 1984 26 p refs
(NASA-TP-2247; L-15559; NAS 1.60:2247) Avail: NTIS HC A03/MF A01 CSCL 05I

In order to measure and analyze the effects of a motion plus g-seat cueing system, a manned-flight-simulation experiment was conducted utilizing a pursuit tracking task and an F-16 simulation model in the NASA Langley visual/motion simulator. This experiment provided the information necessary to determine whether motion and g-seat cues have an additive effect on the performance of this task. With respect to the lateral tracking error and roll-control stick force, the answer is affirmative. It is shown that presenting the two cues simultaneously caused significant reductions in lateral tracking error and that using the g-seat and motion base separately provided essentially equal reductions in the pilot's lateral tracking error. A.R.H.

N84-18190*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HOVER TEST OF A FULL-SCALE HINGELESS HELICOPTER ROTOR: AEROELASTIC STABILITY, PERFORMANCE AND LOADS DATA
Randall L. Peterson and William Warmbrodt Jan. 1984 52 p refs
(NASA-TM-85892; A-9573; NAS 1.15:85892) Avail: NTIS HC A04/MF A01 CSCL 01C

A hover test of a full-scale, hingeless rotor system was conducted in the NASA Ames 40- by 80-foot wind tunnel. The rotor was tested on the Ames rotor test apparatus. Rotor aeroelastic stability, performance, and loads at various rotational speeds and thrust coefficients were investigated. The primary objective was to determine the inplane stability characteristics of the rotor system. Rotor inplane damping data were obtained for operation between 350 and 425 rpm (design speed), and for thurst coefficients between 0.0 and 0.12. The rotor was stable for all conditions tested. At constant rotor rotational speed, a minimum inplane dampling level was obtained at a thrust coefficient approximately = 0.02. At constant rotor lift, a minimum in rotor inplane damping was measured at 400 rpm. Author

N84-18191# Naval Postgraduate School, Monterey, Calif.
COMPUTER PROGRAMS FOR HELICOPTER HIGH SPEED FLIGHT ANALYSIS M.S. Thesis
Waldo Francisco Carmona Sep. 1983 139 p
(AD-A136376) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report gives to the user of the HP41-CV handheld programmable calculator or the IBM 3033 computer a blade element method for calculating the total power required in forward, straight and level high-speed flight for an isolated rotor. The computer programs consist of a main program which calculates the necessary dynamic parameters of the main rotor and several subroutines which calculate power required as well as maximum forward velocity, stall onset velocity, and velocity for best endurance. GRA

N84-18192# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE EFFECT OF PERIODIC OVERLOADS ON FLIGHT-BY-FLIGHT FATIGUE CRACK GROWTH RATES Final Report, Jul. 1977 - May 1979
M. A. Dean Sep. 1983 34 p
(AF Proj. 240-1)
(AD-A136407; AD-E000556; AFWAL-TR-83-3069) Avail: NTIS HC A03/MF A01 CSCL 01/2

The life prediction of aerospace structures subjected to service loading conditions can be complex and expensive. Fortunately, many flight-by-flight loadings can be analyzed as constant amplitude loading if the varibility in crack growth rate is low. A test program was designed such that the stress intensity factor (Kmax) was held constant by uniformly reducing the load as the fatigue crack grew. With a constant Kmax, the crack growth rate remains constant throughout the life of the test. The baseline fatigue crack growth rate variability was established for the 7075-T6 center-cracked panels under a flight-by-flight load history. The effect of introducing overloads to the baseline flight history on the crack growth rate variability was reported. The results indicate that the delay region for the applied 114% overloads was predicted by Irwin's plastic zone model and was equal to 0.0382 inches which was equal to 225 flights. The delay behavior was consistent for the several overload conditions that were studied. When the occurrence of overload increased, the fatigue crack growth decreased. The standard error of estimate remained relatively constant, suggesting that a block approach to life prediction is feasible for flight-by-flight load history. Author (GRA)

N84-18193# Canyon Research Group, Inc., Westlake Village, Calif.
DEVELOPMENT OF SPEECH INPUT/OUTPUT INTERFACES FOR TACTICAL AIRCRAFT Final Report, Dec. 1981 - Jul. 1983
J. C. Cotton, M. E. McCauley, R. A. North, and M. I. Strieb Wright-Patterson AFB, Ohio AFWAL Jul. 1983 185 p
(Contract F33615-81-C-3622; AF Proj. 2403)
(AD-A136485; AFWAL-TR-83-3073) Avail: NTIS HC A09/MF A01 CSCL 01/3

This report covers the methods and the results in the selection of tasks for speech input/output (I/O) in the fighter cockpit of the future. A description is given of the candidate speech tasks derived from interviews with experienced F-16 pilots, an analysis of a composite air-to-ground scenario, and a questionnaire survey of F-16 pilots at Nellis AFB. Author (GRA)

N84-18194# Tactical Air Command, Langley AFB, Va.
AQM-81A FIREBOLT
21 Oct. 1983 5 p
(AD-A135895) Avail: NTIS HC A02/MF A01 CSCL 01/3

Supersonic subscale aerial targets are required for employment in weapons system development, test and evaluation, and training to simulate high performance aircraft and missiles. As a result of extensive studies by the Air Force and Navy and successful completion of advanced development, the AQM-81A Firebolt has been selected at the most cost effective solution to satisfy projected high altitude supersonic requirements. The AQM-81A Firebolt vehicle is 216 inches long and 13 inches in diameter. The propulsion system uses a solid propellant with a liquid oxidizer catalyst. The vehicle contains a parachute recovery system to allow midair retrieval as the primary recovery procedure and a flotation system to allow water recovery. A Programmable Radar Augmentation System (PRAS) provides in the forward hemisphere (+10 to -60 sq m degrees in elevation). The Scalar Scoring System (SSS) provides missiles miss distance information throughout 90 percent of the scoring volume described by a 150-foot sphere centered on the target. The purpose of this project is to support AFOTEC in the IOT&E of the AQM-81A Firebolt system. The purpose of the AQM-81A IOT&E is to evaluate the military utility of the Firebolt system in simulating representative threat targets for weapon system evaluation and training. GRA

N84-18195# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A COST PREDICTION MODEL FOR ELECTRONIC SYSTEMS FLIGHT TEST COSTS M.S. Thesis

T. J. DuPre Sep. 1983 92 p
(AD-A135598; AFIT-LSSR-108-83) Avail: NTIS HC A05/MF A01 CSCL 14/1

Emphasis on improving service cost estimates continues to receive high Department of Defense priority. The purpose of this study was to develop a cost estimating model that would predict flight test costs for electronic systems during early phases of a program's development. It was found that a significant cost estimating relationship (CER) exists between costs and the characteristics of the flight test design. Using a data base collected from the 3246th Test Wing, Eglin Air Force Base, a CER was developed using a multiple regression process. Statistical and logical tests were performed in order to determine the validity of the model. The CER developed may be used as an estimating tool for future budget preparations for flight testing electronic systems. Author (GRA)

N84-18196*# Boeing Vertol Co., Philadelphia, Pa.
INVESTIGATION OF THE EFFECT OF BLADE SWEEP ON ROTOR VIBRATORY LOADS
F. J. Tarzanin, Jr. and R. R. Vlaminck Oct. 1983 134 p
(Contract NAS2-11151)
(NASA-CR-166526; NAS 1.26:166526; AD-A135603) Avail: NTIS HC A07/MF A01 CSCL 01C

The effect of helicopter rotor blade planform sweep on rotor vibratory hub, blade, and control system loads has been analytically investigated. The importance of sweep angle, sweep initiation radius, flap bending stiffness and torsion bending stiffness is discussed. The mechanism by which sweep influences the vibratory hub loads is investigated. Author (GRA)

N84-18197# Naval Postgraduate School, Monterey, Calif.
COMPUTER PROGRAM FOR PRELIMINARY HELICOPTER DESIGN M.S. Thesis
M. W. Rogers Sep. 1983 126 p
(AD-A136026) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report gives the operator of the Hewlett-Packard (HP-41) handheld calculator the ability to quickly and accurately determine the power requirements of a helicopter in the preliminary design phase. These power requirements are computed for three landing gear configurations: skid, fixed wheel, and retractable wheel. By comparing the power required for each configuration, the user can determine the optimum landing gear for the design. Author (GRA)

N84-18198# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Snow and Ice Branch.
MECHANICAL ICE RELEASE PROCESSES. PART 1: SELF-SHEDDING FROM HIGH-SPEED ROTORS
Kazuhiko Itagaki Oct. 1983 14 p
(DA Proj. 4A1-61102-AT-24)
(AD-A135369; CRREL-83-26) Avail: NTIS HC A02/MF A01 CSCL 08/12

Ice accreted on high-speed rotors operating in supercooled fog can be thrown off by centrifugal force, creating severe unbalance and dangerous projectiles. A simple force balance analysis indicates that the strength of accreted ice and its adhesive strength can be obtained by measuring the thickness of the accretion, the location of the separation, the rotor speed, and the density. Such an analysis was applied to field and laboratory observations of self-shedding events. The results agree reasonably well with other observations. Author (GRA)

N84-18199# California Univ., Livermore. Lawrence Livermore Lab. Electromagnetic Sciences Group.
ASSESSMENT METHODOLOGY FOR THE A-7E: SCALE MODEL COUPLING EXPERIMENTS
E. J. Bogdan and D. Wyth May 1983 445 p refs
(Contract W-7405-eng-48)
(DE84-003139; UCID-19850) Avail: NTIS HC A19/MF A01

Transient electromagnetic measurements were performed on a scale model of the A-7E aircraft as part of the FAANTAEL program concerned with the development of a methodology for assessing navy aircraft. A 1:10 scale model of the A-7E was developed and tested in configurations which resemble those used in the full scale aircraft EMP simulation tests at the Air Force Weapons features including a conductive exterior surface, wings that can be folded, and internal compartments. External coupling measurements included horizontal and vertical polarization with wings up and wings down for different modes such as take-off, on ground, and flight. Internal coupling measurements included currents on model cables such as conduit nose to tail and left avionics bay to horizontal tail. The scale model measurement results were extrapolated to compare with those obtained from the full scale tests. The external measurements compare favorably (factors of two for peak amplitudes). Internal measurements show greater variation and are consistently higher in peak amplitudes by factors of two to eight. DOE

N84-18200# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
TRENDING OF CRUISE DRAG
J. P. K. Vleghert 10 Aug. 1982 13 p
(NLR-TR-82078-U) Avail: NTIS HC A02/MF A01

A method to trend cruise performance to an accuracy of + or - 1 % described. The method redefines the so-called stable frame used for cruise performance calculation, but uses standard AIDS practices. It is usable while altitude and air speed vary slightly, and the effect of autothrottle action can be included. Measures necessary to account for atmospheric discrepancies which influence the trend figures are indicated. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-18201*# Cincinnati Univ., Ohio. Dept. of Mechanical and Industrial Engineering.
TURBINE BLADE TESTING METHODS Interim Report
[1984] 80 p refs
(Contract NAS8-34503)
(NASA-CR-170982; NAS 1.26:170982) Avail: NTIS HC A05/MF A01 CSCL 21E

Testing procedures which could be used to model test turbine blades are developed. The methods studied were methods which used and extended current modal testing procedures. An acoustical impacting testing method was perfected for testing small turbine blades. Author

N84-18202*# Santa Clara Univ., Calif. School of Engineering.
SECONDARY FLOW SPANWISE DEVIATION MODEL FOR THE STATORS OF NASA MIDDLE COMPRESSOR STAGES
William B. Roberts and Donald M. Sandercock Feb. 1984 40 p refs
(Grant NAG3-212)
(NASA-CR-173360; NAS 1.26:173360) Avail: NTIS

HC A03/MF A01 CSCL 21E

A model of the spanwise variation of deviation for stator blades is presented. Deviation is defined as the difference between the passage mean flow angle and the metal angle at the outlet of a blade element of an axial compressor stage. The variation of deviation is taken as the difference above or below that predicted by blade element, (i.e., two-dimensional) theory at any spanwise location. The variation of deviation is dependent upon the blade camber, solidity and inlet boundary layer thickness at the hub or tip end-wall, and the blade channel aspect ratio. If these parameters are known or can be calculated, the model provides a reasonable approximation of the spanwise variation of deviation for most compressor middle stage stators operating at subsonic inlet Mach numbers. A.R.H.

N84-18203*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FLIGHT EVALUATION OF THE DEEC SECONDARY CONTROL AIR-START CAPABILITY Final Report

J. Blair Johnson and Jeff Nelson Dec. 1983 21 p refs Prepared in cooperation with NASA, Dryden Flight Research Center

(NASA-TM-84910; H-1186; NAS 1.15:84910) Avail: NTIS HC A02/MF A01 CSCL 21E

The air-start capability of a secondary engine control (SEC) was tested for a DEEC-equipped F100 engine and installed in an F-15 airplane. Two air-start schedules were tested. The first was referred to as the group I schedule; the second or revised schedule was the group II start schedule. Using the group I start schedule, an airspeed of 300 knots was required to ensure successful 40 - and 25-percent SEC-mode air starts. If N2 were less than 40 percent, a stall would occur when the start bleeds closed 40 sec after initiation of the air start. All JFS-assisted air starts were successful with the group start schedule. For the group II schedule, the time between pressurization and start-bleed closure ranged between 50 and 72 sec depending on altitude. All air starts were successful above 225 knots givin a 75-knot reduction in required airspeed for a successful air start. Spooldown air starts of 40 percent were successful at 200 knots at altitudes up to 10,650 m and at 175 knots at altitudes up to 6100 m. Idle rpm was lower than the desired 65 percent for air starts at higher altitudes and lower airspeeds. All JSF-assisted air starts were successful. Author

N84-18204# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

PARTICLE SIZING IN A FUEL-RICH RAMJET COMBUSTOR

R. Turner and R. A. Murphy Aug. 1983 103 p

(Contract N00024-83-C-5301)

(AD-A135632; JHU/APL/TG-1339) Avail: NTIS HC A06/MF A01 CSCL 12/1

A laser Doppler velocimeter (LDV) has been used to measure the size, concentration, and velocity of individual particles having diameters ranging from 3 to greater than 100 micron and having velocities of 600 to 1400 m/s in the fuel-rich exhaust of a ramjet combustor. The visibility of the LDV output was used to measure particle diameters ranging from 3 to under 30 micron and the mean scattered amplitude was used to measure particles ranging from 20 to over 100 micron. The attenuation of one LDV beam provided information on the total amount of material present. Measurements were made along the flow field of a combustor operating at 35 psia, an inlet temperature of 650 to 850 K, and fuel equivalence ratios (ER) of 1.6 and 2.6. Typically, at a point one-half inch from the nozzle and for an ER of 2.6, the average particle velocity is 800 m/s, the average particle size is 50 micron, and the particle density is 250 particles per cubic centimeter. The large particles appear to be unburnt fuel. Author (GRA)

N84-18205# Universal Energy Systems, Inc., Dayton, Ohio.

MULTI-DUCTED INLET COMBUSTOR RESEARCH AND DEVELOPMENT Interim Report, 1 Sep. 1982 - 31 Aug. 1983

G. D. Streby Wright-Patterson AFB, Ohio AFWAL Nov. 1983 70 p

(Contract F33615-81-C-2074; AF Proj. 2308)

(AD-A135906; AFWAL-TR-83-2081; IR-2) Avail: NTIS HC A04/MF A01 CSCL 14/2

Flow visualization studies and fluid flow residence time measurements were conducted of a dual inlet side dump combustor configuration utilizing the Water Tunnel test rig of the Ramjet Technology Branch AFWAL/PORT Wright-Patterson AFB, OH. Tests were conducted of the side dump combustor for inlet duct angles of 30, 45, and 60 degrees and for combustor dome plate positions from 0 to 6 inches forward of the inlet ducts. The nozzle area to combustor area ratio for all testing was 0.29. Tests were conducted with total flow rates of 200, 300, and 400 gals. per min. to give inlet duct Reynolds numbers of 125,640, 188,400 and 251,300 respectively. Preliminary visual observation investigations were also conducted of gas generator and symmetry flows. Engineering and technical support provided to other ramjet combustor test rigs of the Ramjet Technology Branch are detailed. Author (GRA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-18206*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

RECONFIGURABLE MULTIVARIABLE CONTROL LAW FOR COMMERCIAL AIRPLANE USING A DIRECT DIGITAL OUTPUT FEEDBACK DESIGN

Aaron J. Ostroff and Richard M. Hueschen Feb. 1984 55 p refs

(NASA-TM-85759; NAS 1.15:85759) Avail: NTIS HC A04/MF A01 CSCL 01C

The ability of a pilot to reconfigure the control surfaces on an airplane after a failure, allowing the airplane to recover to a safe condition for landing, becomes more difficult with increasing airplane complexity. Techniques are needed to stabilize and control the airplane immediately after a failure, allowing the pilot time to make longer range decisions. This paper shows a design of a discrete multivariable control law using four controls for the longitudinal channel of a B-737. Single control element failures are allowed in three of the four controls. The four controls design and failure cases are analyzed by means of a digital airplane simulation, with regard to tracking capability and ability to overcome severe windshear and turbulence during the aproach and landing phase of flight. Author

N84-18207*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.

THE INTEGRATED MANUAL AND AUTOMATIC CONTROL OF COMPLEX FLIGHT SYSTEMS Semiannual Status Report, 1 Jul. 1983 - 31 Jan. 1984

David K. Schmidt 17 Feb. 1984 137 p refs

(Grant NAG4-1)

(NASA-CR-173308; NAS 1.26:173308) Avail: NTIS HC A07/MF A01 CSCL 01C

A unified control synthesis methodology for complex and/or non-conventional flight vehicles are developed. Prediction techniques for the handling characteristics of such vehicles and pilot parameter identification from experimental data are addressed. Author

N84-18208# National Aerospace Lab., Tokyo (Japan). Airframe Div.

NUMERICAL SIMULATION OF TRANSONIC FLUTTER OF A HIGH-ASPECT-RATIO TRANSPORT WING

Kaji Isogai Aug. 1983 19 p refs

(NAL-TR-776T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The transonic flutter of a wind tunnel model of a slender transport wing with supercritical airfoil sections was simulated using the USTD3 computer code which solves the unsteady 3D full

potential equation by a two step semi-implicit time marching finite difference technique. In order to correct the mean steady-state location and strength of the shock wave, a 2D strip turbulent boundary layer technique was incorporated into the program. The flutter boundary and frequencies predicted by the numerical simulation show satisfactory agreement with those of the experiment. In particular, the flutter dynamic pressure and Mach number where the transonic dip was experienced in the experiment are well predicted by USTF3. The behavior of the unsteady aerodynamic forces on this wing oscillating in pitch is also studied.
Author

N84-18209# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A PILOT/VEHICLE MODEL ANALYSIS OF THE EFFECTS OF MOTION CUES ON HARRIER CONTROL TASKS Final Report, Mar. 1981 - Mar. 1982
S. Baron Sep. 1983 255 p
(Contract N61339-80-D-0014)
(AD-A136291; NAVTRAEQUIPC-80-D-0014-0019-1) Avail: NTIS HC A12/MF A01 CSCL 01/3

In this study, the results of an analytical investigation of pilot control of a simulated AV-8B (Harrier) aircraft are presented. The analysis was performed using a well-established pilot-vehicle model, namely, the Optimal Control Model. The effects on closed-loop performance of aircraft configuration (SAS-ON or SAS-OFF) and flight condition (hover or cruise) and of simulator motion cueing condition (fixed-base, moving platform or g-seat) were all analyzed. In addition, the interaction between these conditions and the level of pilot attention and/or skill (or training) was investigated by means of a sensitivity analysis in which we systematically varied a parameter of the OCM (the observation noise/signal ratio) which can be related to these pilot factors. The results indicate that motion cues could be very significant in the Harrier hover control task for the augmented (SAS-OFF) vehicle. For hover with the SAS-ON and for cruise flight, motion cues are predicted to be, at best, of marginal utility for improving performance. The model results suggest that motion cues may be provided for these tasks by a g-seat with little loss in performance as compared to using platform motion. However, the assumptions underlying the g-seat analysis have not been verified experimentally. Author (GRA)

N84-18210# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MULTIVARIABLE CONTROL LAWS FOR THE AFTI/F-16 M.S. Thesis
A. F. Barfield Jul. 1983 337 p
(AD-A135870; AFIT/GE/EE/83S-4) Avail: NTIS HC A15/MF A01 CSCL 01/3

Recently evolved multivariable design techniques are used to develop control laws for the AFTI/F-16. The techniques were developed by Professor Brian Porter of the University of Salford, England. In the study, designs are investigated to provide pilot control of vehicle rotational rates and accelerations. This line of inquiry is in contrast to the angle control concepts required in previous applications of these new techniques. A computer-aided design package called MULTI is used in refining the control laws to the preliminary design stage. It proves to be invaluable. An aircraft model is developed in state space form for the AFTI vehicle from linearized aerodynamic data. AFTI is equipped with additional control surfaces to provide Direct Force (CCV) control. Major emphasis is placed on the ability to properly blend CCV and conventional control capabilities for combat maneuvering.
GRA

N84-18211# Aeronautical Research Labs., Melbourne (Australia).
THE CUMULATIVE EXCEEDANCE DISTRIBUTION FOR ACCELERATIONS DUE TO TURBULENCE ENCOUNTERED BY A CT/4A AIR TRAINER
D. J. Sherman Aug. 1983 21 p
(AD-A135640; ARL/STRUC-TM-364) Avail: NTIS HC A02/MF A01 CSCL 01/1

A gust load spectrum is estimated for a CT/4A Airtrainer. The spectrum will be used in the specification of a loading sequence for a fatigue test. The accuracy of the estimation method is tested by comparing observed and predicted gust load spectra for the Aero-commander 680. Author (GRA)

N84-18212# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
LOW-SPEED HANDLING QUALITIES OF ADVANCED TRANSPORT AIRCRAFT: A COMPARISON OF GROUND-BASED AND IN-FLIGHT SIMULATOR EXPERIMENTS
M. F. C. vanGool 12 May 1982 60 p refs Revised
(Contracts NIVR-1745; RB-RLD/80.042; RB-RLD/81.014)
(NLR-TR-82041-U-Rev) Avail: NTIS HC A04/MF A01

Approaches and landings were carried out using an in-flight simulator to validate results of experiments carried out on a ground-based simulator, in which handling qualities of transport aircraft equipped with rate-command/attitude-hold flight control systems were investigated. Results indicate that general trends in ground-based and in-flight results are very similar, but air speed control is more difficult in-flight than ground-based, resulting in higher Cooper-Harper ratings for longitudinal handling qualities in-flight. Improvement in pilot opinion with increasing levels of maneuver enhancement observed ground-based is not as explicit in-flight. The air speed problem was investigated by introducing artificial stick force stability in the system through feedback of velocity error. Control improves slightly but pilot opinions differ considerably on the merits of this addition. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-18213# National Aerospace Lab., Tokyo (Japan).
INSTRUMENTATION TECHNIQUES FOR AERODYNAMIC HEATING MEASUREMENT IN NAL HYPERSONIC GUN TUNNEL
Yasutoshi Inoue and Takashi Yamazaki 1983 38 p refs In JAPANESE; ENGLISH summary
(NAL-TR-780; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Development and applications of instrumentation techniques for heat transfer measurements in the NAL hypersonic gun tunnel since 1968 are described. The measuring system, based on transient surface thermometry, mainly consists of a platinum thin film gauge, constant current source and analog network, and enables one to measure the unsteady heating rate with a response time of less than 100 microns. The details of fabrication techniques and performances of the system components are presented. Besides the thin-film gauge made by the sputtering method, a gauge made by the painting and baking method was developed for measurements under erosive circumstances of the gauge in the gun tunnel experiments. An R-C network, an electrical analog of the heat conduction into a slab, is used to obtain the instantaneous heating rate from the output of the thin film gauge. The response times and outputs of analog networks were calculated by the Fourier expansion method. The analysis of non-one dimensional heat conduction effect, which is usually neglected in transient surface thermometry, shows that the effects are significant for the measurement of a heat flux distribution having a steep peak such as observed in shock-interference heating.
Author

N84-18214*# National Aeronautics and Space Administration, Washington, D. C.
REMARKS ON THE LAYOUT OF THE SUBSONIC FREE JET WIND TUNNELS
Jorg-Dieter Vagt Nov. 1983 12 p refs Transl. into ENGLISH from Z. fuer Flugwiss. (West Germany), v. 21, no. 5, 1973

p 159-162 Original language document was announced as A73-33266
(Contract NASw-3541)
(NASA-TM-77326; NAS 1.15:77326) Avail: NTIS HC A02/MF A01 CSCL 14B

By means of a recently installed wind tunnel with a circular free jet, it is shown that requirements concerning the flow parameters (e.g., uniform velocity profile and uniform and low turbulence level in the nozzle exit) can be easily and at moderate expenses fulfilled without changing the settling chamber and the nozzle itself. The installations in the settling chamber are adjustable. The structure is not limited to settling chambers with a circular cross section. Author

N84-18215# National Aerospace Lab., Tokyo (Japan). Aerodynamics Div.
RESULTS OF THE TEST ON ONERA CALIBRATION MODEL M5 IN NAL 2m X 2m TRANSONIC WIND TUNNEL
Aug. 1983 25 p refs
(NAL-TR-774T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The ONERA calibration model M5 was duplicated to be tested in the NAL 2m X 2m transonic wind tunnel. The general trend of the results with respect to Mach number as well as Reynolds number agreed with those obtained in other tunnels. The cause of minor discrepancies was studied in the light of flow characteristics on the model. Precision of model production, and repeatability of force and pressure measurement were also investigated. Author

N84-18216# Northrop Corp., Hawthorne, Calif.
INTEGRATION OF FLIGHT TEST DATA INTO A REAL-TIME SIMULATION
M. W. Tappan, T. C. Dull, C. A. Hughes, and G. M. Tadych [1984] 12 p
Avail: NTIS HC A02/MF A01

A capability which allows for integration of flight test results into the simulation process was established. This capability consists of an automated comparison of flight test and simulation data and, if warranted, the identifications required to improve the simulation's representation of the air-vehicle. This process demonstrated the ability to efficiently integrate flight test results into a real-time simulation for validation and enhancement of the simulated air vehicle's characteristics. Author

N84-18217# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
CAPTIVE TRAJECTORY SYSTEM TEST PLANNING INFORMATION FOR AEDC SUPERSONIC WIND TUNNEL (A) AND HYPERSONIC WIND TUNNELS (B) AND (C) Final Report, 1 Oct. 1981 - 30 Sep. 1982
T. D. Buchanan and W. A. Crosby Arnold AFS, Tenn. AEDC Dec. 1983 48 p
(AD-A136439; AEDC-TR-83-40) Avail: NTIS HC A03/MF A01 CSCL 20/4

Normally in the development of flight vehicle systems, the staging characteristics have to be obtained experimentally. This report briefly describes the specialized methods used in wind tunnel tests at the Arnold Engineering Development Center in simulating the staging process. The capabilities of the mechanisms and the precision to which the data can be obtained are presented, along with descriptions of typical tests. Author (GRA)

N84-18218# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPARISON OF THE LONGITUDINAL FLYING QUALITIES OF AN OPTIMAL PILOT MODEL, A GROUND-BASED SIMULATOR AND AN AIRBORNE SIMULATOR M.S. Thesis
J. M. Payne Sep. 1983 116 p
(AD-A135853; AFIT/GAE/AA/83S-5) Avail: NTIS HC A06/MF A01 CSCL 14/2

This thesis presents a comparison of the longitudinal flying qualities as predicted by an analytical computer model, a ground-based simulator, and an airborne simulator. The comparison was designed to correlate the results and judge whether ground tests could forecast airborne results. Project tests were conducted using the Optimal Pilot Single Axis Control Task (OPSACT) computer program, the ground based Simulator for Aircraft Flight Test and Development (SAFTD), and the variable stability USAF NT-33A aircraft. The objective of this evaluation was to determine and compare the pilot performance in the three cases, and to determine and compare the pilot ratings in the simulators. Secondary objectives included an investigation of the effects of different load factors in the two simulators and the effects of visual and motion cues in the NT-33A. GRA

N84-18219# Air Force Human Resources Lab., Brooks AFB, Tex. Operations Training Div.
SURFACE-ATTACK MISSION SIMULATION: PRELIMINARY SCENARIO EVALUATION Interim Report, Nov. 1980 - Oct. 1981
E. L. Martin and I. G. Lidderdale Nov. 1983 32 p
(AF Proj. 1123)
(AD-A135868; AFHRL-TR-83-21) Avail: NTIS HC A03/MF A01 CSCL 05/9

A part-task deep/strike interdiction scenario was developed for flight simulation application on the Advanced Simulator for Pilot Training (ASPT) configured as an F-16 aircraft. The scenario included visual target-area penetration, attack, and egress. The target was a storage building located in a valley surrounded by mountains terrain. The target area was defended by two threat sites containing surface-to-air missiles (SAMs) and quad-mounted antiaircraft artillery (AAA) and one AAA site co-located with the target building. GRA

N84-18220# Hughes Aircraft Co., Long Beach, Calif.
COST AND PERFORMANCE ANALYSIS OF VISUAL AND SENSOR SIMULATION SYSTEMS USING DEFENSE MAPPING AGENCY DATA BASES Final Report, Aug. 1982 - Oct. 1983
M. L. Nack, A. Rosman, C. Yang, and E. Haseltine Oct. 1983 88 p
(Contract F33615-82-C-1785; AF Proj. 2303)
(AD-A135955; AFWAL-TR-83-1184) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report evaluates the cost and performance of real-time visual and sensor simulation systems. The sensors included are infrared, radar, and low light level TV. The missions to be simulated are the air to ground attack missions of the Air Force Pave Pillar program. Author (GRA)

N84-18221# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A FLIGHT SIMULATION CONCEPT AND AERODYNAMIC BUILDUP FOR INVESTIGATION OF DEPARTURE PREVENTION SYSTEMS IN TACTICAL AIRCRAFT M.S. Thesis
Albert Lawrence Raithel, III Sep. 1983 88 p
(AD-A136182) Avail: NTIS HC A05/MF A01 CSCL 01/3

The conceptual development of a computer flight simulation for design, testing and analysis of departure prevention systems, simulation capability and programming are discussed, along with required research material and data. A description is given of the aerodynamic buildup program written for incorporation in the simulation, including the aerodynamic equations of the model base aircraft, sample program statements and output. GRA

N84-18222# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
INVESTIGATION OF THE FAA OVERLAY DESIGN PROCEDURES FOR RIGID PAVEMENTS Final Report on phase 1
Yu. T. Chou Aug. 1983 158 p
(Contract DTFA01-81-Y-10523)
(AD-A135317; DOT/FAA/PM-83/22) Avail: NTIS HC A08/MF A01 CSCL 13/2

The existing FAA overlay design procedures and their history of development are first briefly presented in the report. This is followed by a detailed summary of consultant's reports, which include the identification of deficiencies in the existing procedures

with suggested improvements. Immediate improvements to several items in the existing procedures are presented for use as new paragraphs and modification of existing paragraphs in the FAA Advisory Circular. Items to be addressed in a Phase II continuation study are presented. Author (GRA)

N84-18223# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
DESIGN AND EVALUATION OF A PULSATING-FLOW WIND TUNNEL
A. Tavakoli, B. K. Kim, G. J. Borell, T. E. Diller, and D. P. Telionis May 1983 180 p refs
(Contract DE-AS05-82ER-12022)
(PB84-116086; VPI-E-83-41) Avail: NTIS HC A09/MF A01 CSCL 14B

A wind tunnel was designed and built to produce pulsating flow. The pulsation was achieved by a series of shutters placed upstream of the settling chamber inlet. The shutters were rotated with the same angular velocity, but a variety of phase differences were used to affect the velocity wave form in the test section. The system was optimized to obtain nearly sinusoidal velocity waveforms with the highest obtainable amplitudes over the frequency range of 3.4 to 39.5 Hz. Velocity and pressure waveforms are given for different shutters, settings and conditions. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-18224*# National Aeronautics and Space Administration, Washington, D. C.
REMEMBERED IMAGES, NASA 1958-1983
1983 138 p Original contains color illustrations
(NASA-EP-200; NAS 1.19:200) Avail: SOD HC $22.00 as 033-000-00901-1 CSCL 22A

A pictorial retrospective of NASA's first 25 years is presented. The Space Shuttle, manned space flight, space sciences, aeronautical research, and Earth orbit applications are discussed. N.W.

N84-18225*# Teledyne Brown Engineering, Huntsville, Ala. Payload Missions Integration Div.
PAYLOAD MISSIONS INTEGRATION Progress Report, 12 Nov. 1983 - 13 Jan. 1984
27 Jan. 1984 50 p
(Contract NAS8-32712)
(NASA-CR-170977; NAS 1.26:170977; PMIC-MA03-469-30) Avail: NTIS HC A03/MF A01 CSCL 22A

SPACELAB missions 1 to 3, OSTA partial payloads, Astro-1 mission, premission definition, and a middeck electronics module are summarized. Author

N84-18226*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERPLANETARY MISSION DESIGN HANDBOOK. VOLUME 1, PART 2: EARTH TO MARS BALLISTIC MISSION OPPORTUNITIES, 1990-2005
Andrey Sergeyevsky, Gerald C. Snyder, and Ross A. Cunniff 15 Sep. 1983 176 p refs
(Contract NAS7-100)
(NASA-CR-173306; JPL-Publ-82-43-Vol-1-Pt-2; NAS 1.26:173306) Avail: NTIS HC A09/MF A01 CSCL 22A

Graphical data necessary for the preliminary design of ballistic missions to Mars are provided. Contours of launch energy requirements, as well as many other launch and Mars arrival parameters, are presented in launch date/arrival date space for all launch opportunities from 1990 through 2005. In addition, an extensive text is included which explains mission design methods, from launch window development to Mars probe and orbiter arrival design, utilizing the graphical data as well as numerous equations relating various parameters. Author

N84-18227# European Space Agency, Paris (France).
THE INTERNATIONAL SOLAR POLAR MISSION: ITS SCIENTIFIC INVESTIGATIONS
K.-P. Wenzel (ESTEC, Noordwijk, Netherlands), R. G. Marsden (ESTEC, Noordwijk, Netherlands), and B. Battrick Jul. 1983 321 p refs Original contains color illustrations
(ESA-SP-1050; ISSN-0379-6566) Avail: NTIS HC A14/MF A01; ESA, Paris FF 175 Member States, AU, CN and NO (+20% others)

The ISPM heliosphere, magnetic field, solar wind, energetic particle, interstellar neutral gas, cosmic ray, radio and plasma wave, solar flare X-ray and cosmic gamma ray burst, interplanetary dust, coronal sounding, and gravitational wave experiments are presented. The spacecraft, mission operations, and common data file are described. For individual titles, see N84-18228 through N84-18245.

N84-18228# Victoria Univ., Wellington (New Zealand).
ISPM AND THE HELIOSPHERE
W. I. Axford *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 3-7 (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

The evolution of the International Solar Polar Mission (ISPM) to explore the heliosphere over the full range of solar latitudes is reviewed. It is suggested that ISPM's scientific return will be maximized if the out-of-ecliptic mission phase is supported by in-ecliptic interplanetary and solar measurements. Author (ESA)

N84-18229# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE ISPM MISSION: SCIENCE OBJECTIVES AND MISSION OVERVIEW
K.-P. Wenzel, R. G. Marsden (JPL), and E. J. Smith *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 9-25 refs Original contains color illustrations (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

The International Solar Polar Mission (ISPM) exploration of the heliosphere within a few astronomical units of the Sun over the full range of heliographic latitudes is described. The ISPM studies, as a function of solar latitude, the properties of the interplanetary medium and solar corona. The scientific instrumentation is designed to explore, in the third heliospheric dimension, the properties of the solar wind, the Sun/wind interface, the heliospheric magnetic field, solar radio bursts and plasma waves, solar X-rays, solar and galactic cosmic rays, and interplanetary/interstellar neutral gas and dust. The ISPM will detect cosmic gamma-ray bursts and search for gravitational waves. It is a cooperative mission carried out by ESA and NASA, to be launched in May 1986, using a Jupiter gravity-assist to achieve a high-solar-latitude trajectory. Author (ESA)

N84-18230*# Imperial Coll. of Science and Technology, London (England).
THE MAGNETIC-FIELD INVESTIGATION ON ISPM
A. Balogh, P. C. Hedgecock, E. J. Smith (JPL), and B. T. Tsurutani (JPL) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 29-45 refs Sponsored in part by UK Science and Engineering Research Council Original contains color illustrations (For primary document see N84-18227 09-12)
(Contract NAS7-100)
Avail: NTIS HC A14/MF A01 CSCL 22A

The International Solar Polar Mission (ISPM) onboard instrumentation for the magnetic field experiment to establish, on the basis of in-situ observations, the heliolatitude dependence of the interplanetary magnetic field, is described. The prime output consists of vector measurements, made by two triaxial magnetometers, of the ambient magnetic field along the orbit of the spacecraft. The onboard data processor generates two data streams to be transmitted through the spacecraft telemetry. The low speed, analog data stream consists of averaged and despun vector measurements, digitized in the spacecraft analog to digital converter

(ADC). The despinning algorithm used in the analog processor is described. The high speed, digital data stream consists of vector measurements digitized in the instrument ADCs, generating up to two vector samples per sec. Multiple data-path switching is used to increase system reliability and to allow cross calibration of the ADCs. On board facilities for inflight calibration are described.
Author (ESA)

N84-18231*# Los Alamos Scientific Lab., N. Mex.
THE ISPM SOLAR-WIND PLASMA EXPERIMENT
S. J. Bame, J. P. Glore, D. J. McComas, K. R. Moore, J. C. Chavez (Sandia National Labs., Albuquerque), T. J. Ellis (Sandia National Labs., Albuquerque), G. R. Peterson (Sandia National Labs., Albuquerque), J. H. Temple (Sandia National Labs., Albuquerque), and F. J. Wymer (Sandia National Labs., Albuquerque) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 47-73 Sponsored by NASA (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01 CSCL 22A

The ISPM solar wind plasma experiment accurately characterizes the bulk flow and internal state conditions of the interplanetary plasma in three dimensions at all heliographic distances and heliographic latitudes reached by the spacecraft. Solar wind electrons, protons, alpha particles, and heavier ions are measured. Oxygen, silicon, and iron ions at various charge levels are resolved. Electrons and ions are measured simultaneously with independent curved-plate electrostatic analysers equipped with multiple continuous channel electron multipliers arranged so that particle velocity distributions are suitably resolved without gaps in spacecraft polar-angle space. Electrons with energies between 1 and 900 eV are detected at 7 polar angles and various combinations of azimuth angle to cover the unit sphere comprehensively. Ions are detected between 257 eV/Q and 35 keV/Q. Data matrices are obtained every 4 min when the spacecraft is actively transmitting and every 8 min during storage periods. These matrices contain sufficient energy and angle resolution to permit detailed calculations of ion velocity distributions.
Author (ESA)

N84-18232*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Dept. of Physics and Astronomy.
THE ISPM SOLAR-WIND ION COMPOSITION SPECTROMETER
G. Gloeckler (Maryland Univ., College Park), J. Geiss (Bern Univ.), H. Balsiger (Bern Univ.), L. A. Fisk (New Hampshire Univ., Durham), F. Gliem (Technische Univ., Brunswick), F. M. Ipavich (Maryland Univ., College Park), K. W. Ogilvie, W. Stuedemann (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau), and B. Wilken (Max-Planck Inst. fuer Aeronomie, Katlenburg-Lindau) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 75-103 refs (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01 CSCL 22A

The International Solar Polar Mission (ISPM) Solar-Wind Ion Composition Spectrometer which determines elemental and ionic-charge composition, and the temperatures and mean speeds of all major solar-wind ions, from H through Fe, at solar wind speeds ranging from 145 km/sec (protons) to 1352 km/sec (Fe+8) is described. The instrument, which covers an energy per charge range from 110 eV/q to 66.7 keV/q in 13 min, combines an electrostatic analyzer with postacceleration, followed by a time-of-flight and energy measurement. Conditions and processes in the region of the corona where the solar wind is accelerated; location of the source regions of the solar wind in the corona; coronal heating processes; the extent and causes of variations in the composition of the solar atmosphere; plasma processes in the solar wind; acceleration of energetic particles in the solar wind; the thermalization and acceleration of interstellar ions in the solar wind, and their composition; and the composition and behavior of the plasma in the Jovian magnetosphere are studied.
Author (ESA)

N84-18233# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
THE ISPM ENERGETIC PANEL PARTICLE COMPOSITION EXPERIMENT
E. Keppler, B. Blake (Aerospace Corp., Los Angeles), G. Wanneberg (Kiruna Geophysical Inst.), A. Korth, G. Morfill (Max-Planck Inst. fuer Extraterrestrische Physik, Garching), S. Olsen (Kiruna Geophysical Inst.), J. Quenby (Imperial Coll. of Science and Technology), A. K. Richter, and G. Umlauft *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 105-121 refs (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

The International Solar Polar Mission (ISPM) Energetic Particle Composition Experiment (EPAC) is introduced. It measures the intensities, anisotropies and energy spectra of low-to-medium energetic interplanetary ions and resolves their masses. The EPAC instrument contains 4 particle telescopes, mounted so that the instrument covers 80% of the full sphere during 1 spin rotation. Each telescope consists of two Si-surface barrier detectors (A and B) surrounded by a plastic scintillator anticoincidence cup (S). Background rejection is achieved by multiparameter analysis. The telescopes are self-calibrating, with particle tracks used to obtain conclusive absolute calibrations. Each telescope system can measure the elemental composition of low-energy nuclei from hydrogen to iron. Detector S works in anticoincidence with detectors A and B. Separation of H and He; 3He and 4He, and C, N, and O is possible, but separation of H and D is not. The analog signal processing concept is described.
Author (ESA)

N84-18234# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
THE ISPM INTERSTELLAR NEUTRAL-GAS EXPERIMENTS
H. Rosenbauer, H. J. Fahr (Bonn Univ.), E. Keppler, M. Witte, P. Hemmerich, H. Lauche, A. Loidl, and R. Zwick *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 123-139 refs Sponsored by Bundesministerium fuer Forschung und Technology (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

Measurement of interstellar gas (neutral helium penetrating the heliosphere) density, bulk velocity relative to the solar system, and temperature by the ISPM GAS (KEP-3) instrument, is described. By employing the solar gravitational field as a natural velocity analyzer, the bulk velocity relative to the solar system and the temperature of the gas can be derived from the angular distributions of the particles measured in at least two widely separated points in the heliosphere. The gas density can be determined if a composition corresponding to cosmic abundances is assumed. The neutral particles are detected via the secondary electrons or ions emitted upon particle impact from a freshly deposited LiF layer. The physical principles and assumptions on which the experiment is based, technical features of the instruments, and performance of the measurements are outlined.
Author (ESA)

N84-18235# Bell Telephone Labs., Inc., Murray Hill, N. J.
THE ISPM EXPERIMENT FOR SPECTRAL, COMPOSITION AND ANISTROPY MEASUREMENTS OF CHARGED PARTICLES AT LOW ENERGIE
L. J. Lanzerotti, R. E. Gold (APL), K. A. Anderson (California Univ., Berkeley), T. P. Armstrong (Kansas Univ., Lawrence), R. P. Lin (California Univ., Berkeley), S. M. Krimigis (APL), M. Pick (Observatoire de Paris-Meudon), E. C. Roelof (APL), E. T. Sarris (Thrace Univ., Greece), and G. M. Simnett (Birmingham Univ., Maryland) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 141-153 refs Sponsored by NASA (For primary document see N84-18227 09-12)
(Contract NOO24-C-5384)
Avail: NTIS HC A14/MF A01

The Heliosphere Instrument for Spectral, Composition, and Anisotropy at Low Energies (HI-SCALE) designed to measure interplanetary ions and electrons is described. Ions and electrons are detected by five separate solid-state detector telescopes oriented to give complete pitch angle coverage from the spinning spacecraft. Ion elemental abundances are determined by a telescope using a thin front detector element in a three-element

telescope. Experiment operation is controlled by a microprocessor-based data system. Inflight calibration is provided by radioactive sources mounted on closable telescope covers. Ion and electron spectral information is determined using broad-energy-range rate channels, and a pulse-height analyzer for more detailed spectra. The instrument weighs 5.775 kg and uses 4.0 W power.
Author (ESA)

N84-18236# Chicago Univ., Ill. Lab. for Astrophysics and Space Research.
THE ISPM COSMIC-RAY AND SOLAR-PARTICLE INVESTIGATION
J. A. Simpson, J. D. Anglin, A. Balogh, M. Bercovitch, J. M. Bouman, E. E. Budzinski, J. R. Burrows, R. Carvell, J. Firth, M. Garcia-Munoz et al *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 155-183 Prepared in cooperation with the National Research Council of Canada, Ottawa and the Imperial Coll. of Science and Technology, London and ESA Space Science Dept. and Kiel Univ. and CEA, Gif-sur-Yvette Original contains color illustrations (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

The Cosmic Ray and Solar Particle Investigation (COSPIN) observations far out of the ecliptic plane are introduced. The COSPIN covers acceleration, and coronal and interplanetary propagation of solar energetic particles; acceleration and propagation of charged particles in interplanetary space; galactic cosmic ray modulation; and from measurements of low energy particles not accessible in the plane of the ecliptic, the source, confinement and propagation of cosmic rays in the Galaxy. These investigations use measurements of intensities, spectra, anisotropies, and the chemical and isotopic composition of nuclei from hydrogen through iron in various energy ranges from 0.3 to 600 MeV nucleon, and of electrons between to 1 and 300 MeV. Above these energies integral flux measurements for nuclei and electrons are performed. The particle telescopes are described.
Author (ESA)

N84-18237*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ISPM UNIFIED RADIO AND PLASMA WAVE EXPERIMENT
R. G. Stone, J. Caldwell, Y. deConchy, C. Deschanciaux, R. Ebbett, G. Epstein, K. Groetz, C. C. Harvey, S. Hoang, R. Howard et al *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 187-207 refs Prepared in cooperation with Observatoire de Paris-Meudon and Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux and Minnesota Univ., Minneapolis and JPL, Pasadena (For primary document see N84-18227 09-12)
(Contract NAS5-25753)
Avail: NTIS HC A14/MF A01 CSCL 22A

Hardware for the International Solar Polar Mission (ISPM) Unified Radio and Plasma (URAP) wave experiment is presented. The URAP determines direction and polarization of distant radio sources for remote sensing of the heliosphere, and studies local wave phenomena which determine the transport coefficients of the ambient plasma. Electric and magnetic field antennas and preamplifiers; the electromagnetic compatibility plan and grounding; radio astronomy and plasma frequency receivers; a fast Fourier transformation data processing unit waveform analyzer; dc voltage measurements; a fast envelope sampler for the solar wind, and plasmas near Jupiter; a sounder; and a power converter are described.
Author (ESA)

N84-18238# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
THE ISPM SOLAR-FLARE X-RAY AND COSMIC GAMMA-RAY BURST EXPERIMENT
F. Cotin, C. deJager (Astronomical Inst., Utrecht), J.-C. Henoux (Observatoire de Paris, Meudon), J. Heise (Astronomical Inst., Utrecht), M. Hilhorst (Astronomical Inst., Utrecht), K. Hurley, M. Neil, G. Paschmann (Max-Planck Inst. fuer Extraterrestrische Physik, Garching), M. Sommer (Max-Planck Inst. fuer Extraterrestrische Physik, Garching), J. VanRooijen (Astronomical Inst., Utrecht) et al *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 211-225 refs (For primary document see N84-18227 09-12)
(Contracts CNES-78-212; CNES-79-212; CNES-80-212; CNES-81-212; CNES-82-212; BMFT-01-ON-088; ZA/WF/WRK-275/4-7.12)
Avail: NTIS HC A14/MF A01

The ISPM solar flare X-ray and cosmic gamma-ray burst instrument is described. It consists of a pair of CsI scintillators and a pair of Si surface barrier detectors for measuring X-rays in the ranges 15 to 150 and 5 to 15 keV. High time resolution X-ray measurements are used to study X-ray gamma ray bursts of solar and cosmic origin. The solar data give information on the acceleration, storage, and anisotropy of solar flare energetic electrons. The cosmic gamma ray burst data are used to localize burst sources to arc-minute accuracy and better, allowing sensitive searches for counterparts to bursters in the optical, radio, and soft X-ray regions. The instrument serves a solar flare patrol function, and examines Jovian X-ray emission. The detector portion of the experiment is boom-mounted, while the digital electronics is placed on the spacecraft body, which includes a microprocessor-managed 32 kbit memory, which stores high time resolution data selected by a trigger system.
Author (ESA)

N84-18239*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE ISPM DUST EXPERIMENT
E. Gruen, H. Fechtig, R. H. Giese, J. Kissel, L. D. Linkert, J. A. M. McDonnell, G. E. Morfill, G. Schwehm, and H. A. Zook *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 229-241 refs Prepared in cooperation with Max-Planck Inst. fuer Kernphysik, Heidelberg and Ruhr Univ., Bochum and Kent Univ., Canterbury and Max-Planck Inst. fuer Extraterrestrische Physik, Garching) (For primary document see N84-18227 09-12)
(Contract BMFT-Q1-ON-048; ZA/WF/WRK-275/4-7.15)
Avail: NTIS HC A14/MF A01 CSCL 22A

The ISPM Dust Experiment observes particulate matter with masses between 10 to the minus 19th power and 10 to the minus 10th power kg in the solar system; investigates its physical and dynamical properties as a function of ecliptic latitude and heliocentric distance; and studies its interaction with solar radiation, the solar wind, and the interplanetary magnetic field. Measurement of the three dimensional spatial distribution of cosmic dust particles and their dynamics allows the relative significance of their probable sources (comets, asteroids and interstellar dust) to be determined. An instrument that measures the mass, speed, flight direction and electric charge of individual dust particles is used. It is a multicoincidence detector with a sensitivity 100,000 times higher than that of previous experiments. The instrument weighs 3.750 kg, consumes 2.0 W, and has a normal data transmission rate of 8 bit/sec in spacecraft tracking mode.
Author (ESA)

N84-18240# Bonn Univ. (West Germany). Inst. fuer Radioastronomisches.
THE IPSM CORONAL-SOUNDING EXPERIMENT
H. Volland, M. K. Bird, and P. Edenhofer (Bochum Univ.) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 243-254 refs (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

Dual frequency ranging and Doppler data will be recorded when ISPM is near superior conjunction to determine the density, turbulence spectrum and velocity of the coronal plasma in the acceleration regime of the solar wind. The best opportunity for coronal sounding with the ISPM spacecraft occurs very close to the next solar minimum, during the in-ecliptic leg of the mission around March/April 1987. High-latitude measurements of electron content, however, should also be possible after Jupiter flyby. Radio-science data during the critical period around superior conjunction will be taken at the 64 m antenna stations of NASA's Deep Space Network which will also record carrier bandwidth and autocorrelation spectra as supplementary data products. The IPSM will cooperate with the Galileo spacecraft.
Author (ESA)

N84-18241# Pavia Univ. (Italy). Dipt. di Fisica Nucleare e Teorica.
THE SEARCH FOR GRAVITATIONAL WAVES WITH ISPM
B. Bertotti *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 255-261 refs (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

Two-way Doppler data will be recorded during selected phases of the ISPM mission around opposition in order to search for gravitational wave pulses and for a continuous gravitational wave background. Low frequency gravitational wave pulses may be produced by the collapse of, or by violent events in, nuclei of quasars and galaxies. A primordial gravitational wave background may exist, similar to the 2.7 K electromagnetic background. The experiment target accuracy of 3 times 10 to the minus 14th power is limited by interplanetary plasma scintillation noise. A coincidence analysis between this and the gravitational wave experiment on Galileo, which has an X-band uplink capability to substantially reduce the plasma noise contributions, is expected to improve greatly the chances of detecting gravitational waves. Author (ESA)

N84-18242# Institut d'Aeronomie Spatiale de Belgique, Brussels.
INTERDISCIPLINARY STUDY OF DIRECTIONAL DISCONTINUITIES IN THE SOLAR WIND WITH ISPM
J. Lemaire, M. Roth, M. Scherer, and M. Schulz (Aerospace Corp., El Segundo, California) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 265-271 refs (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

Large and small-scale irregularities in solar wind plasma are discussed. These collisionless plasma irregularities can be considered as plasmoids. Two adjacent plasma elements are separated by current layers, which can be as thin as a few ion gyro radii (1000 to 3000 km). Across directional discontinuities, the magnetic field direction and intensity change rapidly. Depending on the type of variation shown by the magnetic field and plasma parameters, a directional discontinuity can be either a tangential discontinuity, a shock, a contact discontinuity, or a true rotational discontinuity. Theoretical models of these discontinuities are developed as part of the ISPM investigation. The magnetic and particle observations obtained by ISPM will be used to check these models, and to identify fundamental plasma-physical processes. Author (ESA)

N84-18243# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE ISPM SPACECRAFT
K.-P. Wenzel *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 279-293 refs Original contains color illustrations (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

The International Solar Polar Mission (ISPM) spacecraft which will explore the heliosphere, within a few astronomical units of the Sun, over the full range of heliographic latitudes, is described. It is planned to be launched in May 1986, using a Jupiter gravity-assist to achieve a high solar latitude trajectory. It has an X and S-band communication system and is powered by a radioisotope thermoelectric generator. The scientific payload contains nine instruments to study magnetic fields, solar wind, energetic particles, cosmic rays, plasma waves, cosmic dust, and solar X-rays/cosmic gamma ray bursts. Radio-science investigations will be performed using the spacecraft telecommunication system and NASA's Deep-Space Network. Author (ESA)

N84-18244# European Space Operations Center, Darmstadt (West Germany). Mission and Technical Coordination Office.
ISPM MISSION OPERATIONS
P. B. Lemke *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 297-303 (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

Mission operations for ISPM will be conducted from a control center located at the Jet Propulsion Laboratory, by a spacecraft control team from ESA with ground operations support from JPL. A dedicated minicomputer performs all telemetry data processing required for spacecraft and payload monitoring and control. Author (ESA)

N84-18245# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE ISPM COMMON DATA FILE
K.-P. Wenzel and E. J. Smith (JPL) *In* ESA The Intern. Solar Polar Mission: Its Sci. Invest. Jul. 1983 p 305-308 (For primary document see N84-18227 09-12)
Avail: NTIS HC A14/MF A01

The ISPM Common Data File is a set of time-ordered, physical parameters derived from ISPM observations, available to all investigators, in order to encourage interexperiment data correlation and analysis. It contains magnetic field, solar wind, energetic particle, plasma wave, electron density, radio burst, solar X-ray, ion flux, electron flux, and heavy particle data. Author (ESA)

N84-18246# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
FEASIBILITY STUDY OF AN AUTOMATIC PROTEIN GROWTH FACILITY USING THE RETRIEVABLE CARRIER Final Report
Paris ESA Oct. 1982 140 p
(Contract ESA-5003/82/F-FC(SC))
(MBB-URV-131(82); ESA-CR(P)-1817) Avail: NTIS HC A07/MF A01

A fully automated, spaceborne, Protein Growth Facility (PGF) capable of storing and combining sample solutions, keeping samples at controlled temperature gradients, transmitting still video pictures to ground for assessment of experiment progress, and accepting update commands for temperatures and gradients is proposed for the European Retrievable Carrier. The PGF accommodates a number of separate samples that can be processed simultaneously but are independently temperature controlled. Sample container design allows for different buffer zone lengths and protein chamber cross sections to adapt to the special needs of various experimenters. Author (ESA)

N84-18247# Joint Publications Research Service, Arlington, Va. Foreign Broadcast Information Service.
USSR REPORT: SPACE
26 Jan. 1984 108 p Transl. into ENGLISH of various Russian articles
(JPRS-USP-84-001) Avail: NTIS HC A06

This serial report contains news items, abstracts, and articles of scientific reports on aspects of space including manned mission highlights, space sciences, interplanetary sciences, space engineering, life sciences, space applications, space policy and administration, and a launch table. For individual titles, see N84-18248 through N84-18261.

N84-18248# Joint Publications Research Service, Arlington, Va.
MANNED FLIGHT CHRONOLOGY
In its USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 1-5 Transl. into ENGLISH from various Russian articles, 1983 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

During the 150 day flight abouard the Salyut Space Station, experiments were conducted in the following areas: geophysical research, materials studies, biotechnical research, assembly operations, medical studies, and technical experiments. B.G.

N84-18249# Joint Publications Research Service, Arlington, Va.
PIRAMIG AND PGN EXPERIMENTS
G. M. Nikolskiy *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 6-14 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 13-17 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

A Soviet-French crew conducted astrophysical and geophysical experiments aboard the Salyut-7 space station. The PIRAMIG (Proche InfraRange Atmosphere Milieu Interplanetaire et Galaxies - the near infrared field of the atmosphere, interplanetary medium

and galaxies) and the PCN (Photographie du Ciel Nocturne-Photography of the Night Sky) facilities were used to make the observations. B.G.

N84-18250# Joint Publications Research Service, Arlington, Va.
COSMONAUT TRAINING **c53**
A. G. Nikolayev *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 15-19 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 2-7 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

Training cosmonauts for their professional activities is now accomplished along the following main avenues: training for control of space vehicles and orbital stations, together with operation of onboard systems; training to conduct planned scientific and technical research and experiments; training the cosmonaut's body for the effects of spaceflight factors; the formation of the cosmonaut's personality and his psychological preparation for flight. Training for multiple expedition space flights entails a number of special features and difficulties. This is associated primarily with the need to train a large number of crews simultaneously (including the backup crews). Second, consideration must be given to the differences in the training programs for each expedition in terms both of volume and of tasks. Third, it is necessary to coordinate in time those training tasks connected with the interaction of the crews on the main expedition and those of the visiting expeditions. Author

N84-18251# Joint Publications Research Service, Arlington, Va.
BEREGOVOY ON COSMONAUT TRAINING **c53**
Avn G. Beregovoy *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 20-24 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 4, Apr. 1983 p 1-2 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

With the growth of our knowledge about space and its effect on man, the methods for training cosmonauts were refined and new facilities created. For example, after it was discovered that a cosmonaut's blood rushes to his head during the period of adaptation to weightlessness, new training methods utilizing special devices were developed. And after the first extended flight it turned out that it is difficult for the body to get used to Earth's gravity. The specialists then found methods to ease the cosmonaut's re-encounter with Earth. Cosmonauts stay in orbit for months. This does not mean simple flying, but also performing extremely diversified and complicated research. In order to do this they must have extensive knowledge in the most variegated fields of science and technology. This knowledge is acquired during the stage of general space training, which is conducted in groups according to an overall program. During this period the cosmonauts' individual special features are studied; this is necessary for the selection of future crews, since mutual psychological compatibility must also be taken into consideration. Author

N84-18252# Joint Publications Research Service, Arlington, Va.
SPACECRAFT SIMULATORS **c14**
I. Pochkayev and V. Grigorenko *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 25-26 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 4, Apr. 1983 p 3 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

A scientifically substantiated training system that meets the requirements of today and future problems is now in operation at the Cosmonaut Training Center imeni Yu.A. Gagarin. Its material basis is a training base that is constantly being developed and includes integrated and special trainers, stands and simulators for spaceflight conditions. The integrated trainers for simulating transport ships and orbital stations make it possible to work out all stages of a flight into space in sequence. In connection with this, the following basic operations are gone through most carefully: injection into orbit; orbital flight with orientation of a manned spacecraft (PKA) on the Sun, the Earth, terrestrial orientation points, the stars and the planets; PKA navigation on the basis of objects in space; maneuvering in orbit; finding, approaching and docking with other spacecraft; undocking and descent from orbit. Author

N84-18253# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON PROGNOZ-9 SATELLITE **c15**
R. Sagdeyev, N. Kardashv, and I. Strukov *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 30-32 Transl. into ENGLISH from Pravda (Moscow), 10 Oct. 1983 p 7 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

On 1 July 1983, the Prognoz-9 artificial earth satellite was launched. For the first time, the main task of space research is to study the structure of the universe as a whole and the main features of its evolution. Contemporary concepts of the structure of the universe are linked to facts derived from astronomical observations which have received a thorough theoretical grounding. Another area of research is concerned with the elucidation of the chemical composition of matter in the universe. The relative abundance of the various elements is under study, not only in terrestrial laboratories and on various bodies of the solar system, but also at vast distances in space as far as the most distant quasars. With the help of the radiation map of the heavens in the millimeter range it will be possible to arrive at solutions of other important astronomical questions as well. These include determining the distribution, in our galaxy, of regions of hot plasma, of electrons with superhigh energies and of interstellar dust. Author

N84-18254# Joint Publications Research Service, Arlington, Va.
BIOMEDICAL EXPERIMENTS ON SOVIET-FRENCH FLIGHT **c51**
Ye. I. Vorobyev and A. R. Krotovskaya *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 47-55 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 18-22 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

Soviet-French space cooperation has permitted a large number of experiments dealing with virtually all fields of space research to be conducted. Working groups were organized in accordance with the main directions of scientific research (space physics, space communications, meteorology, and space biology and medicine). The first joint biological experiment, the Tsitos experiment, was conducted in real space flight conditions on the manned Salyut-6 station. The effect of space flight factors primarily weightlessness, on the growth and development of very simple biological objects were studied. The Bioblok-2 radiobiological experiment was conducted in order to gain an understanding of the effect of cosmic radiation on biological objects. Author

N84-18255# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SPACE BOTANY EXPERIMENTS **c51**
Aleksandr Mashinskiy and Galina Nechitaylo *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 56-63 Transl. into ENGLISH from Tekhn.-Molodezhi (Moscow), no. 4, Apr. 1983 p 2-7 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

An analysis on Earth showed that despite the external similarity with the controls, plants differed in terms of cell structure, biochemical makeup, and growth characteristics. Plants grew but failed to flower or produce seeds. In the absence of gravity, water and gas exchange in plants takes place differently, and the problem arises of removing metabolites and insuring the necessary heat conditions, since natural convection is also absent. Methods of growing plants is discussed, leading up to the successful cultivation and flowering of arabidopsis. B.C.

N84-18256# Joint Publications Research Service, Arlington, Va.
SPACECRAFT COMMAND-MEASUREMENT COMPLEX **c14**
G. M. Tamkovich *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 64-69 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 46-52 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

Today's command-measure complex is a complicated, multi-

functional, technically unique, automated control complex for controlling all the Soviet space apparatuses, vehicles and stations in active existence in space. The parameters of the space object's motion (range, velocity, angle) within a specified time are measured, the measurement results are processed in computers using specially developed algorithms and programs that determine orbital parameters and predict moyion, determine the deviation of motion parameters from the calculated parameters and (if necessary) correct the motion, and maneuver and recover the apparatus. The complex for these tasks makes up the ballistics service for the flight of a space apparatus. Objective information on the status of various onboard systems, the operation of automatic devices, temperature and pressure in the orbital compartment of a vehicle and much else is obtained after telemetry data were processed.
Author

N84-18257# Joint Publications Research Service, Arlington, Va.
NELEPO DESCRIBES INTERCOSMOS-BLACK SEA EXPERIMENT **c48**
B. Nelepo *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 70-73 Transl. into ENGLISH from Pravda (Moscow), 9 Oct. 1983 p 3 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

Many specialists asserted that light scattering by the atmosphere certainly creates an impenetrable curtain for observation of processes at the ocean surface, much less in its deeper layers. But a series of excellent photographs of dynamically active regions of the ocean, obtained from orbit, made possible a new approach to the problem of observing them from great altitudes. Despite the influence of the atmosphere the study of the ocean from space in the visible range of the spectrum is possible under definite observation conditions. In order to clarify these conditions the oceanographic satellites Cosmos-1076 and Cosmos-1151 were launched, carrying automatic instruments aboard intended for study of optical phenomena in the ocean-atmosphere system. During this same period the multichannel MKS spectrometer, operated excellently in orbit. At the same time principles were formulated for the analysis of images obtained from satellites of the Meteor series and the best conditions were clarified for carrying out observations in the visible range.
Author

N84-18258# Joint Publications Research Service, Arlington, Va.
COSMOS-1500 SLR USED FOR ARCTIC ICE RECONNAISSANCE **c43**
V. Shmyganovskiy *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 74-76 Transl. into ENGLISH from Izv. (Moscow), 6 Nov. 1983 p 6 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

The very difficult present navigation in the eastern part of the Arctic has required the use of the latest achievements of science and the most efficient technical facilities--primarily for the purpose of ice reconnaissance. Striking results were achieved using a side-looking radar for remote sounding of the environment, developd at the Ukrainian SSR Academy of Sciences Institute of Radio Physics and Electronics (Kharkov) and mounted aboard the Cosmos-1500 satellite. Neither snow storms nor the polar night can stop it from conducting strategic reconnaissance of the ice fields in the grimmest of the oceans.
Author

N84-18259# Joint Publications Research Service, Arlington, Va.
PRAVDA SCORES US REACTION TO DRAFT TREATY ON USE OF FORCE IN SPACE **c84**
A. Sitnikov *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 86-89 Transl. into ENGLISH from Pravda (Moscow), 24 Sep. 1983 p 4 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

Major U.S.S.R. initiatives were set forth to prevent the militarization of space which envisage adoption of a set of measures capable of averting the danger that the arms race will spread to space.
Author

N84-18260# Joint Publications Research Service, Arlington, Va.
COMMENT ON DIRECT TELEVISION BROADCAST BY SATELLITE **c32**
A. Terekhov *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 90-91 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 4, Apr. 1983 p 44-45 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

With the development of space technology, direct television broadcasting (DBS) has become a reality from studio to satellite to home television set. It can either contribute to the expansion of cultural exchanges and further closeness among the peoples of the world or it can drive them apart. In an effort to eliminate the possibility of an undesirable development of events, the Soviet Union came forth with an initiative for the development of international legal standards defining the rights and obligations of states with respect to television broadcasting via satellites. Author

N84-18261# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL SPACE ORGANIZATIONS **c84**
Ye. P. Kamenetskaya and S. A. Nikitin *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 92-98 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 23-27 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

International cooperation in space research and the use of space is effected on a bilateral and multilateral basis. Dozens of international organizations are now connected with the coordination of efforts in space research. International cooperation in space research and the use of space also takes place today through international organizations that do not have as their main purpose joint efforts in space research and through international organizations whose main purpose is to develop international cooperation along the most varied avenues of space research and the use of space. These organizations include the International Organization for Maritime Satellite Communications (INMARSAT), the Intersputnik International Space Communications Organization, the International Organization for Telecommunications via Artificial Earth Satellites (INTELSAT), the European Space Agency (ESA), and also the Committee on Space Research (COSPAR); and also the International Astronautical Federation (IAF), the International Academy of Astronautics (IAA), the International Institute of Space Law (IISL), and others.
Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-18262*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
CONTROL OF LARGE FLEXIBLE SPACECRAFT BY THE INDEPENDENT MODAL-SPACE CONTROL METHOD Interim Report
Leonard Meirovitch and Joram Shenar Washington NASA Jan. 1984 212 p refs
(Contract NAG1-225)
(NASA-CR-3760; NAS 1.26:3760) Avail: NTIS HC A10/MF A01 CSCL 22B

The problem of control of a large-order flexible structure in the form of a plate-like lattice by the Independent Modal-Space Control (IMSC) method is presented. The equations of motion are first transformed to the modal space, thus obtaining internal (plant) decoupling of the system. Then, the control laws are designed in the modal space for each mode separately, so that the modal equations of motion are rendered externally (controller) decoupled. This complete decoupling applies both to rigid-body modes and elastic modes. The application of linear optimal control, in conjunction with a quadratic performance index, is first reviewed. A solution for high-order systems is proposed here by the IMSC method, whereby the problem is reduced to a number of modal minimum-fuel problems for the controlled modes.
Author

N84-18263# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
ALGORITHM FOR REAL TIME CONTROL OF NON LINEAR SYSTEMS WITH APPLICATION TO THE CONTROL SATELITE ALIGNMENT SYSTEMS [ALGORITMO PARA CONTROLE EM TEMPO REAL DE SISTEMAS COM NAO-LINEARIDADE SEPARADA APLICADO AO CONTROLE DE APTAMENTO DE SISTEMAS DE RASTREAMENTO DE SATELITES ARTIFICIAIS]
Valcir Orlando and Octavio Maizza Neto May 1983 13 p refs In PORTUGUESE; ENGLISH summary Presented at the 7th Brazilian Congr. on Mech. Eng., Uberlandia, Brazil, 13-16 Dec. 1983
(INPE-2755-PRE/331) Avail: NTIS HC A02/MF A01

A numerical algorithm is developed for optimal position alignment real time control of satellite tracking systems. The nonlinearity function is used as the system control variable. The true control variable values to be applied in the consecutive steps were then calculated by inversion of the nonlinearity function. To test the procedure a numerical simulation is made for tracking a low altitude satellite by two currently used tracking systems.
Author

N84-18264# National Aerospace Lab., Tokyo (Japan).
OPTIMAL LOW-THRUST INTERPLANETARY ORBIT TRANSFER INCLUDING EARTH ESCAPE SPIRAL TRAJECTORY
Shoichi Yoshimura and Tatsuo Yamanaka Aug. 1983 36 p refs (NAL-TR-778T; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A numerical analysis was carried out on minimum-time low-thrust Earth-Mars transfer including Earth escape spiral trajectory. This is a three-point boundary-value problem with a constraint at the interior point t=t(1) when the hyperbolic velocity is attained in the geocentric force field, and the terminal constraints at the final time t=t(f) (=t(1) +t(2)). Minimal time t(1) asterisk for the Earth escape problem is obtained here by the authors in a manner similar to that in Ref. 3, and t(1) astrisk for the Earth-Mars heliocentric transfer problem is well-known. A three-dimensional search procedure using delta t(1), delta t(f), and the control correction length alpha as three parameters is developed to solve the present complicated problem numerically. The obtained total mission time t(f) is slightly shorter than the sum of t(1) asterisk and t(2) asterisk. The control history in the escape portion is quite different from that in an optimal escape problem, but in the interplanetary portion it is similar to that in an optimal interplanetary transfer problem.
Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-18252# Joint Publications Research Service, Arlington, Va.
SPACECRAFT SIMULATORS
I. Pochkayev and V. Grigorenko *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 25-26 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 4, Apr. 1983 p 3 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

N84-18256# Joint Publications Research Service, Arlington, Va.
SPACECRAFT COMMAND-MEASUREMENT COMPLEX
G. M. Tamkovich *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 64-69 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 46-52 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-18265*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 1: EXECUTIVE STUDY Final Report
21 Apr. 1983 69 p refs
(Contract NASw-3680)
(NASA-CR-173334; NAS 1.26:173334; D180-27477-1-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 22B

Mission identification and validation, the benefits of a manned presence in space; attributes and architectures; time-phased mission and system requirements imposed on the space station; orbit selection; space station architectural options; technology selection; and program planning are addressed.
N.W.

N84-18266*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 2: MISSION ANALYSIS Final Report
21 Apr. 1983 412 p refs
(Contract NASw-3680)
(NASA-CR-173333; NAS 1.26:173333; D180-27477-2-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 22B

Space environment studies, astrophysics, Earth environment, life sciences, and material sciences are discussed. Commercial communication, materials processing, and Earth observation missions are addressed. Technology development, space operations, scenarios of operational capability, mission requirements, and benefits analysis results for space-produced gallium arsenide crystals, direct broadcasting satellite systems, and a high inclination space station are covered.
N.W.

N84-18267*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 3: REQUIREMENTS
21 Apr. 1983 57 p refs
(Contract NASw-3680)
(NASA-173332; NAS 1.26:173332; D180-27477-3-Vol-3) Avail: NTIS HC A94/MF A01 CSCL 22B

A typical system specification format is presented and requirements are compiled. A Program Specification Tree is shown showing a high inclination space station and a low inclination space station with their typical element breakdown, also represented along the top blocks are the interfaces with other systems. The specification format is directed at the Low Inclination space station.
Author

N84-18268*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. VOLUME 4: ARCHITECTURAL OPTIONS, SUBSYSTEMS, TECHNOLOGY AND PROGRAMMATICS Final Report
21 Apr. 1983 207 p refs
(Contract NASw-3680)
(NASA-CR-173331; NAS 1.26:173331; D180-27477-4-Vol-4) Avail: NTIS HC A10/MF A01 CSCL 22B

Space station architectural options, habitability considerations and subsystem analyses, technology, and programmatics are reviewed. The methodology employed for conceiving and defining space station concepts is presented. As a result of this approach, architectures were conceived and along with their supporting rationale are described within this portion of the report. Habitability consideration and subsystem analyses describe the human factors associated with space station operations and includes subsections covering (1) data management, (2) communications and tracking, (3) environmental control and life support, (4) manipulator systems, (5) resupply, (6) pointing, (7) thermal

management and (8) interface standardization. A consolidated matrix of subsystems technology issues as related to meeting the mission needs for a 1990's era space station is presented. Within the programmatics portion, a brief description of costing and program strategies is outlined. Author

N84-18269*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. FINAL EXECUTIVE REVIEW
5 Apr. 1983 126 p refs
(Contract NASw-3680)
(NASA-CR-173335; NAS 1.26:173335; D180-7477-6) Avail: NTIS HC A07/MF A01 CSCL 22B

Identification and validation of missions, the benefits of manned presence in space, attributes and architectures, space station requirements, orbit selection, space station architectural options, technology selection, and program planning are addressed. N.W.

N84-18270*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. PART 1: SUMMARY Final Briefing Report
9 Apr. 1983 150 p refs Prepared in cooperation with COMSAT General and General Electric
(Contract NASw-3685)
(NASA-CR-175382; NAS 1.26:175382; SA-SSP-RP009-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 22B

Candidate missions for the space station were subjected to an evaluation/filtering process which included the application of budgetary constraints and performance of benefits analysis. Results show that the initial space station should be manned, placed in a 28.5 deg orbit, and provide capabilities which include a space test facility, satellite service, a transport harbor, and an observatory. A space industrial park may be added once further development effort validates the cost and expanding commercial market for space-processed material. Using the space station as a national space test facility can enhance national security, as well as commercial and scientific interests alike. The potential accrued gross mission model benefit derived from these capabilities is $5.9B without the industrial park, and $9.3B with it. Other benefits include the lowering of acquisition costs for NASA and DoD space assets and a basis for broadening international participation. A.R.H.

N84-18271*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS: SUMMARY BRIEFING Final Report
Apr. 1983 120 p refs
(Contract NASw-3687)
(NASA-CR-173328; NAS 1.26:173328; MDC-H0180) Avail: NTIS HC A06/MF A01 CSCL 22B

Computerized data sorting and analysis techniques were used with a data base accumulated in over 20 years of space station studies to evaluate candidate missions and select a final model of 88 missions. The social, cultural, scientific, technical, and commercial benefits to be accrued from each mission were identified. Requirements were determined for satellite servicing; payload placement and retrieval; refueling; repair; testing; assembly; and construction. Missions drivers determined include crew, remote manipulating system, external parts, instrumentation, extravehicular activity/manned maneuvering unit, and voice/video equipment. User interest for commercial applications were determined. Variable architecture based on a modular concept with multi-use elements is proposed. A.R.H.

N84-18272*# TRW Space Technology Labs., Redondo Beach, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. FINAL REVIEW EXECUTIVE SUMMARY BRIEFING
5 Apr. 1983 136 p refs
(Contract NASw-3681)
(NASA-CR-173252; NAS 1.26:173252) Avail: NTIS HC A07/MF A01 CSCL 22B

User needs and mission requirements, architecture and mission implementation, and program costs and benefits are discussed. Author

N84-18273*# Martin Marietta Aerospace, Bethesda, Md. Space and Electronics Systems Div.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. BRIEFING MATERIAL: FINAL REVIEW AND EXECUTIVE SUMMARY
Apr. 1983 70 p refs Sponsored in part by Department of Defense
(Contract NASw-3686)
(NASA-CR-173321; NAS 1.26:173321; SOC-SE-02-02) Avail: NTIS HC A04/MF A01 CSCL 22B

Advantages and disadvantages were assessed for configuration options for a modular 14' diameter space station, a modular aft cargo carrier and a shuttle derived vehicle. Early, intermediate, and mature configurations were defined as well as power requirements, heat rejection, hydrazine usage, and the external scavenging concept. Subsystems were analyzed for propulsion, attitude control, data processing, and communications. Areas of uncertainties, associated costs and benefits, and the cost by phase of the modular and shuttle derived vehicle configurations were identified. Technologies assessed included solar vs nuclear; gravity gradient vs active control; heat pipe radiators vs fluid loops; distributed processors vs centralized, and modular vs shuttle derived configuration. It was determined that the early space station architecture should include: (1) reusable OTV with aerobraking; (2) TMS with telepresence services; (3) OTV/TMS refueling and servicing capability; and (4) attached research laboratories for life sciences and materials processing. A.R.H.

N84-18274*# Rockwell International Corp., Downey, Calif. Shuttle Integration and Satellite Systems Div.
SPACE STATION NEEDS, ATTRIBUTES, AND ARCHITECTURAL OPTIONS STUDY Final Executive Summary Briefing
6 Apr. 1983 79 p
(Contract NASw-3683)
(NASA-CR-173327; NAS 1.26:173327; SSD-83-0037) Avail: NTIS HC A05/MF A01 CSCL 22B

Recommended program architecture; missions and requirements, programmatic evolution; space station architecture, technology, and cost; and space station attributes and benefits are discussed. N.W.

N84-18275*# General Dynamics/Convair, Fort Worth, Tex.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. SUMMARY OF MAJOR STUDY ACTIVITIES AND RESULTS. SPACE STATION PROGRAM OBSERVATIONS Final Briefing Report
Otto Steinbronn and Don Charhut 5 Apr. 1983 136 p refs
(Contract NASw-3682)
(NASA-CR-173345; NAS 1.26:173345) Avail: NTIS HC A07/MF A01 CSCL 22B

Space station study logic, commercial applications, total mission set space station system, mission requirements, free flyer missions, a baseline time phased mission set, and space systems architecture are discussed. N.W.

N84-18276*# Wisconsin Univ., Madison. Dept. of Statistics.
DESIGN CRITERIA AND EIGENSEQUENCE PLOTS FOR SATELLITE COMPUTED TOMOGRAPHY
Grace Wahba Nov. 1983 20 p refs
(Contract NAG5-316)
(NASA-CR-172787; NAS 1.26:172787; TR-732) Avail: NTIS HC A02/MF A01 CSCL 22B

The use of the degrees of freedom for signal is proposed as a design criteria for comparing different designs for satellite and other measuring systems. It is also proposed that certain eigensequence plots be examined at the design stage along with appropriate estimates of the parameter lambda playing the role of

noise to signal ratio. The degrees of freedom for signal and the eigensequence plots may be determined using prior information in the spectral domain which is presently available along with a description of the system, and simulated data for estimating lambda. This work extends the 1972 work of Weinreb and Crosby. Author

N84-18277*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE STATION TECHNOLOGY, 1983
Robert L. Wright, ed. and Cathy R. Mays, ed. Feb. 1984 189 p Workshop held in Williamsburg, Va., 28-31 Mar. 1983
(NASA-CP-2293; L-15732; NAS 1.55:2293) Avail: NTIS HC A09/MF A01 CSCL 22B

This publication is a compilation of the panel summaries presented in the following areas: systems/operations technology; crew and life support; EVA; crew and life support: ECLSS; attitude, control, and stabilization; human capabilities; auxillary propulsion; fluid management; communications; structures and mechanisms; data management; power; and thermal control. The objective of the workshop was to aid the Space Station Technology Steering Committee in defining and implementing a technology development program to support the establishment of a permanent human presence in space. This compilation will provide the participants and their organizations with the information presented at this workshop in a referenceable format. This information will establish a stepping stone for users of space station technology to develop new technology and plan future tasks. For individual titles, see N84-18278 through N84-18289.

N84-18278*# Boeing Aerospace Co., Seattle, Wash.
SYSTEMS/OPERATIONS TECHNOLOGY **c18**
Gordon R. Woodcock *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 1-24 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

The deliberations of the Systems/Operations Technology Panel are summarized. The first real question that arose was to develop an understanding of what systems/operations technology is. A relatively new discipline in the NASA technology organization, necessitates the definition of the objectives. Two objectives were established: (1) to make new things possible, and (2) to make existing capabilities cost less or work better. Making new things possible is not really applicable in the case of a space station. Both Salyut 7 and Skylab indicate that space stations are possible with existing (not necessarily new) technology. There was a concern on the part of some of the penelists that work better might mean higher performance, and that is not necessarily the case at all. Work better may mean simply to provide better service to the users of the space station at lower cost. The panel felt this to be a more realistic viewpoint. As evidenced from interaction with users (and all of the contractors found this basically to be true), the users want low cost, no schedule constraints, and no hassles.
Author

N84-18279*# Texas Woman's Univ., Houston.
CREW AND LIFE SUPPORT: EVA
Richard S. Johnston *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 25-32 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

Four general recommendations by the EVA subpanel are listed as follows: 1) EVA design standard document needs to be dveloped in the next 6 to 12 months and updated as technology progresses. 2) NASA needs to couple EVA design personnel closer to the user community. 3) there appears to be a lack of centralized NASA responsibility for the EVA community. 4) Panel activity should continue to promote exchange of information and understanding of user problems, and to stimulate technology activity. Author

N84-18280*# General Dynamics Corp., San Diego, Calif.
CREW AND LIFE SUPPORT: ECLSS
George Drake *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 33-40 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

The schedule NASA has proposed has four main elements. The focal point of all the life support activity is demonstrator for the initial space station. The demonstrator is composed of items that are ready for Phase C and D development. Technical options are scheduled during the early years to provide alternatives because the capability to substitute must be maintained. Growth technology and supporting research and technoiogy (SR&T) will continue throughout the program life, and as new items emerge, the space station capability will be updated. Author

N84-18281*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
ATTITUDE, CONTROL AND STABILIZATION
B. G. Morais *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 41-60 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

In the area of control, several problems can arise during the evolution of the space station. These incude: 1) the use of multiple or articulated flexible bodies; 2) the need for distributed cntrol for maneuvering and maintaining altitude; 3) hierarchical control to automate and manage control systems; 4) structual control (from the standpoint of appendage stamping; isolation, and possible figure control); 5) cntrol position and orientation for component modules during construction (an evolutionary requirement); 6) control during docking and undocking operations; and 7) the normal requirements for stablity and control during systems operations. In addition, there are a number of key technology concerns, such as significant landing modes which tend to be closely spaced and distributed widely, distributed sensors and actuators which are collecated, and the wide distribution of landing modes that must be reduced from a dimensional standpoint. Author

N84-18282*# Little (Arthur D.), Inc., Cambridge, Mass.
HUMAN CAPABILITIES
William Augerson *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 61-83 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

In conclusion, habitability is more than just life support and there is a substantial technology and application void. Habitability needs both visibility and responsibility in the space station program to ensure the optimum use of man in space. In the area of work technology, IVA and EVA teleoperators and robotics should be considered as tools and not competitors. A generic work station is a contemporary of the early space stations. Flexibility of a future space station requires this. Author

N84-18283*# Aerojet-General Corp., Sacramento, Calif.
AUXILIARY PROPULSION
Sanders D. Rosenberg *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 85-87 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

When man is put in the loop, almost anything can happen. Caution must be exercised in permitting life cycle costs analysis to control technology investment. One of the ways of reducing cost is to stay with the old tried and true technology. However, when requirements of a permanent space station are considered (15-year life, the issues associated with health monitoring, maintenance, and repair), the conclusion is that very little, if anything, is really state of the art. Before investing in old technologies to make them comply with the requirements of a permanent space station, the question of whether or not it is worth putting the money there as opposed to advancing the state of the art should be considered. Program managers and system designers must not make the mistake of selecting old technologies in the belief that they are state of the art. Author

N84-18284*# Martin Marietta Corp., Denver, Colo.
FLUID MANAGEMENT
Dale Fester *In* NASA. Langley Research Center Space Station

Technol., 1983 Feb. 1984 p 89-94 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

The Fluid Management Panel's assessment of the technology is summarized. Since a baseline space station was not defined as a reference guide and the results of the eight contracted space station studies were not available as input, the assessment focused on technology and not programmatics. The ground rules that were key to the deliberations and guided the assessment are: (1) The space station will be operational in 1991, and (2) A space-based OTV will be operational in 1992. Thus, the capability to transport, transfer, and resupply all fluids, including those for the OTV, is required in the initial space station. The only evolutionary aspect is the refinement of capability. Fluid management includes fluid transport to orbit, liquid storage/supply, fluid transfer/resupply, and integral thermal control. Author

N84-18285*# TRW Electronic Systems Group, Redondo Beach, Calif.
COMMUNICATIONS
G. J. Bonelle *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 95-108 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

Communications in any system is one of the last technologies to be considered, and sometimes it is considered too late to impact the system. This was somewhat the impression on reviewing the NASA budget for two mission scenarios for the space station. However, that budget fortunately was well spent, and the money was spent to get the most benefit per dollar. Another thing that is very often forgotten is that technology is not produced in a vacuum. In fact, in conducting independent research and development (IR&D), the first phase is to define the requirements which must be time phased, becuase very often the conditions will change during the life of the system. From the requirements, a set of architectures that are at least representative of that era are produced. If the exact requirements were not established, at least boundaries are set on the requirements for that architecture. When this is completed, then the technology that is really needed is defined. The major criticism of the work that was presented to the panel is the lack of a firm set of requirements. Author

N84-18286*# General Electric Co., Philadelphia, Pa.
STRUCTURES AND MECHANISMS
David Purdy *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 109-135 (For primary document see N84-18277 09-15`
Avail: NTIS HC A09/MF A01 CSCL 22B

Structures, materials, and mechanisms is one of the older technologies in the aerospace business. The Structures, Materials, and Mechanisms Panel was divided into the four basic categories that fit the overall responsibilities of the panel: materials, mechanisms, structural design, and analysis. Author

N84-18287*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
DATA MANAGEMENT
Glen Love *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 137-154 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

The following tasks were prioritized: software acquisition management plan; space station flight data system architectural study; space station user data system interface; automation of software development process; automation of software testing; distributed data base management; ADA (automated data acquisition) evaluation and transition and planning; network operating system software; fault tolerant computer validation methodology for onboard data management system; systems integration; artificial intelligence/expert systems; space station data network concept; space station standard interface protocols; space station data networks systems; integrated software development facility; and language trade studies. Author

N84-18288*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
POWER
Robert Corbett *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 155-163 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

The space station requires an increase in power or energy of at least several orders of magnitude compared to previous space missions. With the requirement up in the range of 10 kilowatt hours, this obviiously requires the development of new technology. Although the power area is very well integrated in the spacecraft itself, it represents a diverse set of components necessary for energy conversion, electronics, and energy distribution. Considerable work is ongoing at NASA Lewis in the power devices development area, including transformers, large area solid-state chips, transistors, and fast recovery diodes. This work is oriented toward eventual application to both AC and DC power conversion approaches. In the energy storage area, there are many options available to fit into the space station representing various degrees of risk and leverage combination, such as the near-term integral-pressure-vessel nickel hydrogen battery, an advanced Ni-H2 battery concept, and the regenrative hydrogen-oxygen system utilizing essentially the Shuttle orbiter type of fuel cell. Author

N84-18289*# Grumman Aerospace Corp., Bethpage, N.Y.
THERMAL CONTROL
Bob Haslett *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 165-186 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

There are basically three key ingredients to the thermal control system for any large space platform or space station. These are heat rejection (from a centralized radiator or from body mounted radiators), heat acquisition (from payloads), and heat transport (via a transport loop to the radiator). The echnical approach in the heat rejection area is to construct the radiator from individual elements so that it can be built on-orbit, is very insensitive to meteoroid and debris hazards, and is repairable. In the area of thermal acquisition and transport an added effort to better understand two phase flow in zero gravity by analysis and testing is suggested. Author

N84-18290*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 4, ATTACHMENT 1: TASK 2 AND 3 MISSION IMPLEMENTATION AND COST Final Study Report
22 Apr. 1983 393 p refs
(Contract NASw-3684)
(NASA-CR-173330; NAS 1.26:173330;
LMSC-D889718-Vol-4-Attach-1) Avail: NTIS HC A17/MF A01 CSCL 22B

Mission scenario analysis and architectural concepts, alternative systems concepts, mission operations and architectural development, architectural analysis trades, evolution, configuration, and technology development are assessed. N.W.

N84-18291*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, ATTACHMENT 2: SUPPORTING DATA AND ANALYSIS REPORTS Final Study Report
22 Apr. 1983 174 p refs
(Contract NASw-3684)
(NASA-CR-173329; NAS 1.26:173329;
LMSC-D889718-Vol-2-Attach-2) Avail: NTIS HC A08/MF A01 CSCL 22B

Architectural impact analysis, configuration concepts evaluation, CADAM draining file, EVA technology needs and manned system technology requirements are provided. N.W.

N84-18292*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 1: EXECUTIVE SUMMARY NASA Final Presentation Report

5 Apr. 1983 368 p refs
(Contract NASw-3684)
(NASA-CR-172792; NAS 1.26:172792; LMSC-D889718-Vol-1)
Avail: NTIS HC A16/MF A01 CSCL 22B

The uses alignment plan was implemented. The existing data bank was used to define a large number of station requirements. Ten to 20 valid mission scenarios were developed. Architectural options as they are influenced by communications operations, subsystem evolvability, and required technology growth are defined. Costing of evolutionary concepts, alternative approaches, and options, was based on minimum design details. N.W.

N84-18293*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 1, ATTACHMENT 1: EXECUTIVE SUMMARY NASA Final Study Report
22 Apr. 1983 281 p refs
(Contract NASw-684)
(NASA-CR-173337; NAS 1.26:173337;
LMSC-D889718-Vol-1-Attach-1) Avail: NTIS HC A13/MF A01 CSCL 22B

User alignment plan, physical and life sciences and applications, commercial requirements national security, space operations, user needs, foreign contacts, mission scenario analysis and architectural concepts, alternative systems concepts, mission operations architectural development, architectural analysis trades, evolution, configuration, and technology development are discussed. N.W.

N84-18294*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 1, ATTACHMENT 2: SUPPORTING DATA AND ANALYSIS REPORTS Final Study Report
22 Apr. 1983 402 p refs
(Contract NASw-3684)
(NASA-CR-173336; NAS 1.26:173336;
LMSC-D889718-Vol-1-Attach-2) Avail: NTIS HC A17/MF A01 CSCL 22B

Reference space station evolution, a contact list, a data base, scenarios, and subcontractor reports are considered. N.W.

N84-18295# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
SIMPLIFIED ANALYSIS OF THE PROBLEM OF RETRIEVAL FOR A STABILIZED ARTIFICIAL SATELLITE BY A GRAVITY GRADIENT [ANALISE SIMPLIFICADA DO PROBLEMA DE CAPTURA PARA UM SATELITE ARTIFICIAL ESTABILIZADO POR GRADIENTE DE GRAVIDADE]
Paulo Tadeu de Mello Lourencao, Helio Koiti Kuga, and Octavio Maizza Neto May 1983 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 7th Brazilian Mech. Eng. Congr., Uberlandia, Brazil, 13-16 Dec. 1983
(INPE-2756-PRE/332) Avail: NTIS HC A02/MF A01

By means of extensions and retractions of a boom, a strategy to conduct a gravity gradient stabilized satellite to the nominal operation position (attitude) is proposed. Considerations based on both conservative laws of angular momentum and Jacobi's integral of motion are taken into account. Numerical integration results are presented and compared with the corresponding analytical results. Author

N84-18296*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 1, PART 1: MISSION REQUIREMENTS Final Technical Report
20 Apr. 1983 210 p refs
(Contract NASw-3685)
(NASA-CR-173312; NAS 1.26:173312;
SA-SSP-RP008-Vol-2-Bk-1-Pt-1) Avail: NTIS HC A10/MF A01 CSCL 22B

The baseline mission model used to develop the space station mission-related requirements is described as well as the 90 civil missions that were evaluated, (including the 62 missions that formed the baseline model). Mission-related requirements for the space station baseline are defined and related to space station architectural development. Mission-related sensitivity analyses are discussed. A.R.H.

N84-18297*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 1, PART 2, TASK 1: MISSION REQUIREMENTS Final Technical Report
20 Apr. 1983 239 p refs
(Contract NASw-3685)
(NASA-CR-173313; NAS 1.26:173313;
SA-SPP-RP008-Vol-2-Bk-1-Pt-2) Avail: NTIS HC A11/MF A01 CSCL 22B

Mission areas analyzed for input to the baseline mission model include: (1) commercial materials processing, including representative missions for producing metallurgical, chemical and biological products; (2) commercial Earth observation, represented by a typical carry-on mission amenable to commercialization; (3) solar terrestrial and resource observations including missions in geoscience and scientific land observation; (4) global environment, including representative missions in meteorology, climatology, ocean science, and atmospheric science; (5) materials science, including missions for measuring material properties, studying chemical reactions and utilizing the high vacuum-pumping capacity of space; and (6) life sciences with experiments in biomedicine and animal and plant biology. A.R.H.

N84-18298*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 1, PART 3: MANNED SPACE STATION RELEVANCE TO COMMERCIAL TELECOMMUNICATIONS SATELLITES Final Technical Report
20 Apr. 1983 77 p refs
(Contract NASw-3685)
(NASA-CR-173314; NAS 1.26:173314;
SA-SSP-RP008-Vol-2-Bk-1-Pt-3) Avail: NTIS HC A05/MF A01 CSCL 22B

A document containing a forecast of satellite traffic and revelant technology trends to the year 2000 was prepared which includes those space station capabilities and characteristics that should be provided to make the station useful to commercial satellite owners. The document was circulated to key representative organizations within the commercial telecommunications satellite and related communities of interest, including spacecraft manufacturers, commercial satellite owners, communications carriers, networks and risk insurers. The prospectus document is presented as well as the transmittal letter and the mailing list of the people and companies that were asked to review it. Key commercial telecommunications comments are summarized the actual response letters from the industry are included. A.R.H.

N84-18299*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 1, PART 4: PAYLOAD ELEMENT MISSION DATA SHEETS Final Technical Report
20 Apr. 1984 299 p refs
(Contract NASw-3685)
(NASA-CR-173315; NAS 1.26:173315;
SA-SSP-RP008-Vol-2-Bk-1-Pt-4) Avail: NTIS HC A13/MF A01 CSCL 22B

Data sheets are presented for 11 internal payloads, 30 externally mounted payloads, and 46 free flyers. The importance of the space station to each payload element is rated on a scale of 1 to 10. The type of experiment noncommercial science and applications, commercial, technological, and operational is indicated and the payload and its objectives are described. Space is provided for noting requirements for power; data/communication; thermal environment; equipment physical characteristics; crew size; and service and maintenance. A.R.H.

N84-18300*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 2, PART 1: MISSION IMPLEMEN-

TATION CONCEPTS Final Technical Report
20 Apr. 1983 188 p refs
(Contract NASw-3865)
(NASA-CR-173316; NAS 1.26:173316;
SA-SSP-RP008-Vol-2-Bk-2-Pt-1) Avail: NTIS HC A09/MF A01 CSCL 22B

The overall configuration and modules of the initial and evolved space station are described as well as tended industrial and polar platforms. The mass properties that are the basis for costing are summarized. User friendly attributes (interfaces, resources, and facilities) are identified for commercial; science and applications; industrial park; international participation; national security; and the external tank option. Configuration alternates studied to determine a baseline are examined. Commonality for clustered 3-man and 9-man stations are considered as well as the use of tethered platforms. Requirements are indicated for electrical, communication and tracking; data management Subsystem requirements for electrical, data management, communication and tracking, environment control/life support system; and guidance navigation and control subsystems are identified. A.R.H.

N84-18301*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 2, PART 2, TASK 2: INFORMATION MANAGEMENT SYSTEM Final Technical Report
20 Apr. 1983 315 p refs Prepared in cooperation with General Electric Corp.
(Contract NASw-3685)
(NASA-CR-173317; NAS 1.26:173317;
SA-SSP-RP008-Vol-2-Bk-2-Pt-2) Avail: NTIS HC A14/MF A01 CSCL 22B

Missions to be performed, station operations and functions to be carried out, and technologies anticipated during the time frame of the space station were examined in order to determine the scope of the overall information management system for the space station. This system comprises: (1) the data management system which includes onboard computer related hardware and software required to assume and exercise control of all activities performed on the station; (2) the communication system for both internal and external communications; and (3) the ground segment. Techniques used to examine the information system from a functional and performance point of view are described as well as the analyses performed to derive the architecture of both the onboard data management system and the system for internal and external communications. These architectures are then used to generate a conceptual design of the onboard elements in order to determine the physical parameters (size/weight/power) of the hardware and software. The ground segment elements are summarized. A.R.H.

N84-18302*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS. VOLUME 2, BOOK 2, PART 3: COMMUNICATION SYSTEM Final Technical Report
20 Apr. 1983 64 p refs
(Contract NASw-3685)
(NASA-CR-173318; NAS 1.26:173318;
SA-SSP-RP008-Vol-2-Bk-2-Pt-3) Avail: NTIS HC A04/MF A01 CSCL 22B

Preliminary results of the study of the architecture and attributes of the RF communications and tracking subsystem of the space station are summarized. Only communications between the space station and other external elements such as TDRSS satellites, low-orbit spacecraft, OTV, MOTV, in the general environment of the space station are considered. The RF communications subsystem attributes and characteristics are defined and analyzed key issues are identified for evolution from an initial space station (1990) to a year 2000 space station. The mass and power characteristics of the communications subsystem for the initial space station are assessed as well as the impact of advanced technology developments. Changes needed to the second generation TDRSS to accomodate the evolutionary space station of the year 2000 are also identified. A.R.H.

N84-18303*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS, VOLUME 2, BOOK 2, PART 4: INTERNATIONAL REPORTS Final Technical Report
20 Apr. 1983 172 p refs
(Contract NASw-3685)
(NASA-CR-173319; NAS 1.26:173319;
SA-SSP-RP008-Vol-2-Bk-2-Pt-4) Avail: NTIS HC A08/MF A01 CSCL 22B

The capabilities of the European Space Agency's SPAS and EURECA platforms for reference payload accommodation are considered. The instrument pointing subsystem, the position and hold mount, and the antenna pointing mechanism developed by Dornier are described. Relevant payloads for the space station are summarized and space station accommodation aspects are discussed. A.R.H.

N84-18304*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS, VOLUME 3, BOOK 3: COST AND PROGRAMMATICS Final Technical Report
20 Apr. 1983 79 p refs
(Contract NASw-3685)
(NASA-CR-173320; NAS 1.26:173320; SA-SSP-RP008-Vol-2-Bk-3)
Avail: NTIS HC A04/MF A01 CSCL 22B

The cost and programmatic considerations which integrate mission requirements and architectural options into a cohesive system for exploitation of space opportunities within affordable limits are discussed. The mission requirements, baseline architecture, a top level baseline schedule, and acquisition costs are summarized. The work breakdown structure (WBS) used to structure the program, and the WBS dictionary are included. The costing approach used, including the operation of the primary costing tool, the SPACE cost model are described. The rationale for the choice of cost estimating relationships is given and costs at the module level are shown. Detailed costs at the subsystem level are shown. The baseline schedule and annual funding profiles are provided. Alternate schedules are developed to provide different funding profiles. Alternate funding sources are discussed and foreign and contractor participation is outlined. The results of the benefit analysis are given and the accrued benefits deriving from an implemented space station program are outlined. A.R.H.

N84-18305# Department of Defence, Canberra (Australia).
LINEARISED OPTIMAL CONTROL AND APPLICATION TO A GLIDING PROJECTILE
G. Jepps 1981 136 p
(AD-A135605) Avail: NTIS HC A07/MF A01 CSCL 12/1

The standard results of linearized optimal control theory are explored and examined to see how they can be applied to flight control systems. A feedback control system operating on the elevators of an aircraft-like gliding projectile is investigated. The projectile is required to closely follow a predetermined maximum range trajectory in the face of initial disturbances. Equations of motion are set up and linearized. Approximate solutions for the maximum range trajectory are given and approximate analytical expressions for the eigenvalues of the plant matrix and derived. After assigning weighting values to the state and control variables in the integral quadratic performance index, solutions to the Riccati matrix equation are computed and used to evaluate optimal state feedback gain vectors. The effect of this optimal feedback on glider performance is observed from computed trajectory simulations. An optimal feedback gain vector is selected subject to limitations on angle of attack, elevator deflection angle, and attitude. The question of incomplete state variable feedback is considered in the interest of simpler engineering design. Using a reduced order system representation, relationships between performance index weights and closed loop poles are established and a sub-optimal system based on feedback of only one state variable is investigated. Author (GRA)

N84-18306# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

TARGET TRACK AND STABILIZATION FOR MANPORTABLE DIRECT FIRE MISSILES Final Technical Report, 30 Sep. 1980 - 30 Nov. 1981
F. Gentile and G. Tutt Nov. 1981 172 p
(Contract DAAH01-80-C-1618)
(AD-A136219; AD-E900279; MDC-G9941) Avail: NTIS HC A08/MF A01 CSCL 17/5

Tradeoff analyses were conducted to select an optimum method for tracking armored vehicles and stabilizing a laser beam for beamrider missile guidance, for a manportable infantry weapon. The optimum approach was found to be a two-axis gimbal-mounted infrared sensor and laser projector, with IR image autotrack and gyro stabilization. A breadboard example was built and tested, demonstrating the practicality and indicating expected performance of the recommended method. Author (GRA)

N84-18307# Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
SUITABILITY OF VISCOELASTIC MATERIALS FOR NUTATION DAMPING OF SPIN-STABILIZED SATELLITES [EIGNUNG VON VISKOELASTISCHEN MATERIALIEN ZUR NUTATIONSDAEMPFUNG DRALLSTABILISIERTER SATELLITEN]
Harald Hahn 1983 141 p refs In GERMAN
(ILR-55; ISBN-3-7983-0856-X; ISSN-0341-0587) Avail: NTIS HC A07/MF A01

Three nutation damper configurations were tested for viscoelastic materials. Equatorial and meridional pendulum dampers, and the spring-mass-damper were compared. Their motion equations are derived for the balanced and unbalanced case, and the optimization of the characteristic equation roots locus is investigated. It is shown that the balancing of the system satellite-damper simplifies the handling of the problem and the interpretation of the calculation results. The equatorial pendulum damper is found to be superior to the others for damping time optimization and construction. For optimization approximation, von Zajacs theorem and energy sink approximation are used. A combination of both methods with minimum calculation time leads to nearly exact results in finding the absolute maximum and the minimum damping time. Author (ESA)

N84-18308# European Space Agency, Paris (France).
EURECA: AN INTRODUCTION TO EUROPE'S FREE-FLYING RETRIEVABLE CARRIER
N. Longdon, ed. Jul. 1983 15 p refs Original contains color illustrations
(ESA-BR-16) Avail: NTIS HC A02/MF A01

A free-flying platform which can be transported into space by shuttle, left in orbit for up to 6 months, and then retrieved, and the platform, instruments, and experiment facilities refurbished or reused, is introduced. A 400 N thruster and tanks containing sufficient propellant for a total velocity change of 400 m/sec allow the carrier to lift itself from its shuttle deployment orbit (300 km) to altitudes compatible with the atmospheric drag and orbit-decay requirements of of microgravity missions (500 km). The core payload constitutes 70% to 80% of the total 1000 to 1200 kg payload of the first mission (materials science, protein crystallization, botany, exobiology/radiation biophysics experiments). Author (ESA)

N84-18253# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON PROGNOZ-9 SATELLITE
R. Sagdeyev, N. Kardashiv, and I. Strukov *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 30-32 Transl. into ENGLISH from Pravda (Moscow), 10 Oct. 1983 p 7 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-18461# Rockwell International Corp., Downey, Calif. Shuttle Orbiter Div.
SPACE SHUTTLE ORBITER RUDDER/SPEED BRAKE ACTUATION SYSTEM
Dwight Woolhouse *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 55-61 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-18309# National Aerospace Lab., Tokyo (Japan).
A METHOD FOR AERODYNAMIC AND AEROTHERMODYNAMIC CONCEPTUAL DESIGN OF CAPSULE TYPE REENTRY VEHICLE
Shigeaki Nomura Aug. 1983 79 p refs In JAPANESE; ENGLISH summary
(NAL-TR-779; ISSN-0389-4010) Avail: NTIS HC A05/MF A01

The conceptual design of a capsule type reentry vehicle was investigated aerodynamically and aerothermodynamically in order to find a method for determining the optimum thermal protection thickness under arbitrary constraints such as deceleration rate, down range, and so forth. Topics discussed include: (1) aerodynamic and aerothermodynamic circumstances along trajectories; (2) aerodynamic characteristics vs. capsule configurations; (3) atmospheric trajectories vs. aerodynamic characteristics; (4) aerodynamic heating distributions vs. capsule configurations and attack angles; and (5) analyses of thermal protection systems (TPS) consisting of expendable ablators and of reusable ceramic tiles. A method is presented for determining optimum TPS with optimum conditions for trajectories, capsule configurations and attack angles. As examples, optimum TPS designs are demonstrated both for charring ablator and for alumina tile under a constrained deceleration rate of less than 2 gs. A.R.H.

N84-18310*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LABORATORY DEGRADATION OF KAPTON IN A LOW ENERGY OXYGEN ION BEAM
Dale C. Ferguson 1984 15 p refs Presented at the AIAA Shuttle Environment and Operations Meeting, Washington, 31 Oct.

- 2 Nov. 1983
(NASA-TM-83530; E-1841; NAS 1.15:83530) Avail: NTIS HC A02/MF A01 CSCL 14B

An atomic oxygen ion beam, accelerated from a tunable microwave resonant cavity, was used at Lewis Research Center to bombard samples of the widely used polyimide Kapton. The Kapton experienced degradation and mass loss at high rates, which may be comparable to those found in Space Shuttle operations if the activation energy supplied by the beam enabled surface reactions with the ambient oxygen. The simulation reproduced the directionality (ram-wake dependence) of the degradation, the change in optical properties of the degraded materials, and the structure seen in scanning electron micrographs of samples returned on the Shuttle Trails with a substituted argon ion beam produced no rapid degradation. Energy Dispersive X-ray Analysis (EDAX) showed significant surface composition changes in all bombarded samples. Mass loss rates and surface composition changes are discussed in terms of the possible oxidation chemistry of the interaction. Finally, the question of how the harmful degradation of materials in low Earth orbit can be minimized is addressed. Author

N84-18311# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS ELEVEN (ACTIVE CONTROL OF SPACE STRUCTURES), VOLUME 1 Interim Report, Apr. - Nov. 1982
Eli Fogel, Daniel R. Hegg, N. Harris McClamroch, and Jiguan C. Lin Griffiss AFB, N.Y. RADC Jul. 1983 140 p 2 Vol.
(Contract F30602-81-C-0180; AF Proj. C655)
(AD-A135675; CSDL-R-1598-Vol-1; RADC-TR-83-158-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 22/1

This volume documents the progress made in four principal areas during this reporting period: (1) The difficulties encountered in the Large Space Structure (LSS) system identification were studied. Focusing on the high-resolution identification problem, a procedure for identifying lightly damped, closely spaced modes is derived; (2) Two approaches to the incorporation of actuator dynamics and the role of actuator transducers in LSS vibration control were explored; (3) A modal dashpot/modal spring control design is presented; and (4) A controlled experiment for the ACOSS design is proposed in which each principal element in the overall synthesis process is systematically examined. Author (GRA)

N84-18312# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS ELEVEN (ACTIVE CONTROL OF SPACE STRUCTURES), VOLUME 2 Interim Report, Jun. - Nov. 1982
Thomas H. Brooks and David Anding Griffiss AFB, N.Y. RADC Jul. 1983 148 p 2 Vol.
(Contract F30602-81-C-0180; AF Proj. C655)
(AD-A135676; CSDL-R-1598-Vol-2; RADC-TR-83-158-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 22/1

In analysis and simulation of Space-based Surveillance System Performance, a key variable is the scene/sensor interaction, under subcontract to CSDL, Photon Research Associates has developed a software package capable of generating and manipulating terrestrial scene data sets as a function of major surveillance system and mission parameters. This report documents the details of this simulation, called Genesis, which has now been incorporated into the Draper Integrated Simulations. Author (GRA)

N84-18313# Air Force Academy, Colo.
SCALE MODEL TESTING FOR CONTROL SYSTEM PARAMETERS OF LARGE STRUCTURES Final Report, Aug. 1982 - Aug. 1983
R. T. Evans, B. J. Simmons, S. M. Brown, D. A. Erchinger, and M. E. Mathews Oct. 1983 35 p
(AF Proj. 230-8)
(AD-A135652; FJSRL-TR-83-0011) Avail: NTIS HC A03/MF A01 CSCL 22/2

The premise is made that as an alternate to or enhancement to finite element analysis of a large complex structure, scale model tests can provide useful parameters for control system design. The objective is to minimize risks associated with expensive construction of large complex space structures by better predictions of the associated structural dynamics. This report covers construction of scale models, and comparison of scale model parameters to the full size structure. A comparison of the results obtained for three scale models yields general relationships that can be applied to future large complex structure development and to a conclusion that structural characteristics pertaining to control system parameters can be determined from scale model tests. GRA

N84-18314# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ASSESSMENT OF DATA HANDLING CONFIGURATIONS FOR ONBOARD OPERATING SYSTEM DEFINITION (PHASE 1) Final Report
R. Katzenbeisser, O. Neff, U. Muedsam, and H. Reffel Paris ESA Apr. 1983 194 p refs
(Contract ESTEC-4712/81/NL-HP(SC))
(ESA-CR(P)-1787) Avail: NTIS HC A09/MF A01

Spacecraft missions were analyzed, and mission classes were established for data handling configurations. Parameters relevant for the definition on an onboard data handling (OBDH) configuration were cataloged. Requirements for each mission class were quantified. Block diagrams of OBDH configurations were drawn and a preferred OBDH solution was investigated. Data acquisition, telemetry, housekeeping, onboard control, telecommand, command processing, and user requirements were studied. A decentralized OBDH system requiring synchronous or asynchronous protocols for data exchange is proposed. Author (ESA)

N84-18315# European Space Agency, Paris (France).
SPACELAB DATA BOOK
Norman Longdon, comp. and James Hunt, ed. Sep. 1983 127 p Original contains color illustrations
(ESA-BR-14; ISSN-0250-1589) Avail: NTIS HC A02/MF A01

The Spacelab program is outlined. Crew training, functions, and accommodation are described. Safety factors; accommodation for experiments; structural design; the Igloo; command and data management subsystem; electrical power distribution; environment control; and the transfer tunnel are described. Ground operations; ground support; mission operations; and possible developments are outlined. Author (ESA)

N84-18278*# Boeing Aerospace Co., Seattle, Wash.
SYSTEMS/OPERATIONS TECHNOLOGY
Gordon R. Woodcock *In* NASA. Langley Research Center Space Station Technol., 1983 Feb. 1984 p 1-24 (For primary document see N84-18277 09-15)
Avail: NTIS HC A09/MF A01 CSCL 22B

N84-18460# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
SPACELAB SCIENTIFIC AIRLOCK
W. A. denHaak *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 47-54 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-18316# National Aerospace Lab., Tokyo (Japan).
[NUMERICAL SCHEMES USED IN THE COMPUTER PROGRAM FOR NOZZLE PERFORMANCE PREDICATIONS OF LIQUID ROCKET ENGINES]
1983 30 p refs
(NAL-TR-771; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Numerical schemes used in the computer program for nozzle performance predictions of liquid rocket engines are described. The program is a set consisting of the following four programs: a program of one-dimensional equilibrium flow (ODE), a one-dimensional kinetic flow (ODK), a two-dimensional kinetic flow (TDK), and a turbulent boundary layer (TBL). Published programs were utilized for ODE and TBL, but the programs for ODK and TDK were newly developed. In the TDK program, an efficient numerical scheme for a two-dimensional nonequilibrium flow was devised for rocket nozzle flowfields, and is described in detail in this report. Computational results are presented for hydrogen/oxygen and NTO/A-50 propellant engines, showing the utility of the present computer program by comparing it with available experimental data. Author

N84-18317# National Aerospace Lab., Tokyo (Japan).
AN EXPERIMENTAL AND ANALYTICAL STUDY ON SPRAY FLOW FIELD BY LIQUID/GAS COAXIAL INJECTOR ELEMENTS. 3: APPLICATION FOR THE COMBUSTION PERFORMANCE PREDICTION MODEL OF LO2/LH2 ROCKET COMBUSTION
Nobuyuki Yatsyanagi 1983 33 p refs
(NAL-TR-769; ISSN-00389-4010) Avail: NTIS HC A03/MF A01

An analytical computing model for performing LO2/LH2 rocket combustor performance analysis was derived by using the results of former studies of spray flow field characteristics of liquid/gas coaxial injector elements. Each process of liquid atomization, mixing of liquid phase to gas phase and vaporization of liquid droplets are the combustion controlling models. The calculation of combustion gas parameters and liquid droplets histories along the chamber axis, the prediction of C* efficiencies and the calculation of heat flux distribution were performed for sub-scaled combustors and actual rocket engines such as the RL-10, LE-5 and HM-7. The predicted C* efficiencies were almost within + or - %, compared to the values obtained from experiments. The calculated heat flux values were also in close agreement with values obtained from experiments. Author

N84-18318# National Aerospace Lab., Tokyo (Japan).
COMPUTATIONS OF TRANSONIC, CHEMICALLY REACTING FLOWS IN ROCKET NOZZLES
Kazuhiro Nakahashi 1983 14 p refs In JAPANESE; ENGLISH summary
(NAL-TR-766; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A time-dependent, semi-implicit scheme is developed for solving the equations governing two-dimensional, chemically reacting nonequilibrium flow inside rocket nozzles. Subsonic and transonic flowfields of the nozzle entrance and throat region can be analyzed using this computational scheme. All equations of motion are solved simultaneously at each grid point by treating the time derivatives implicitly, in order to make the scheme stable with respect to the chemical rates. By evaluating spatial derivative terms explicitly, the scheme is made simple and has the advantage that only a relatively small computer storage is required. Results are presented at first for a nonreacting flow inside the JPL nozzle in order to illustrate the proposed scheme's validity by comparison with the experimental data and the result of the Cline's scheme. Then the nozzle flowfields of conventional rocket engines, whose propellants are hydroganoxygen and NTO/A-50 (nitrogen tetroxid and a blend of 50 percent hydrazine and 50 percent unsymmetrical dimethyl hydrazine), are analyzed. A computational result of a dual-expander nozzle flowfield is also presented. Author

N84-18319# National Aerospace Lab., Tokyo (Japan).
STUDY OF BURNOUT FRAME ROCKETS. 1: STUDY OF SMALL ROCKET WITH BURNOUT FRAME FOR WEATHER MODIFICATIONS
Yojiro Mutoh 1983 17 p refs In JAPANESE; ENGLISH summary
(NAL-TR-764; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The frame of the rocket is composed of G.F.R.P. containing a pyrotechnic mixture. The rockets, launched at an angle of 85 deg, reached a height of over 6 Km above sea level, leaving a smoke trail 1.5-2 Km in length. After scattering the reagent (AgI) into cumulus clouds for weather modification, the rocket does not detonate but rather burns into minute ashes to insure that it causes no damage on the Earth's surface. The advantages of this rocket can be applied in projects for producing artificial rain, for preventing thunderbolt damage, for precipating rate, etc. Author

N84-18320# National Aerospace Lab., Tokyo (Japan).
[THEORETICAL TREATMENT OF THE MECHANISM OF RESIDUAL THRUST]
Aug. 1983 18 p refs In JAPANESE; ENGLISH summary
(NAL-TR-777; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A small residual thrust is often observed in a solid propellant rocket after a solid propellant has burned out. This residual thrust causes some fatal problems to vehicles flying at a high altitude. The theoretical treatment of the mechanism of residual thrust is presented. The heat accumulated in a graphite nozzle and the radiative heat transfer from the heated nozzle were estimated first. The decomposition of the irradiated insulator, which covers the inner surface of the motor case, is analyzed by the asymptotic method with a large activation energy of the thermal decomposition. The decomposed gas exhausted through the nozzle to produce the residual thrust is evaluated. Each of these phenomena was mathematically formulated to select important parameters determining the magnitude and history of the residual thrust. Author

N84-18321*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
EXPERIMENTAL INVESTIGATION OF A HALL-CURRENT THRUSTER M.S. Thesis
Gregory M. Plank Jan. 1983 49 p refs
(Grant NsG-3011)
(NASA-CR-168133; NAS 1.26:168133) Avail: NTIS HC A03/MF A01 CSCL 21C

The Hall-current accelerator is being investigated for use in the 1000-2000 sec. range of specific impulse. Three models of this thruster were tested. The first two models had three permanent magnets to supply the magnetic field and the third model had six magnets to supply the field. The third model thus had approximately twice the magnetic field of the first two. The first and second models differ only in the shape of the magnetic field. All other factors remained the same for the three models except for the anode-cathode distance, which was changed to allow for the three thrusters to have the same magnetic field integral between the anode and the cathode. These Hall thrusters were tested to determine the plasma properties, the beam characteristics, and the thruster characteristics. The thruster operated in three modes: (1) main cathode only, (2) main cathode with neutralizer cathode, and (3) neutralizer cathode only. The plasma properties were measured along an axial line, 1 mm inside the cathode radius, at a distance of 0.2 to 6.2 cm from the anode. Results show that the current used to heat the cathode produced nonuniformities in the magnetic field, hence also in the plasma properties. In a Hall thruster this general design appears to provide the most thrust when operated at a magnetic field less than the maximum value studied. Author

N84-18322*# Colorado State Univ., Fort Collins. Dept. of Physics.
SPUTTERING PHENOMENA IN ION THRUSTERS Final Report
Raymond S. Robinson and Stephen M. Rossnagel Feb. 1983 32 p refs
(Grant NAG3-209)
(NASA-CR-168172; NAS 1.26:168172) Avail: NTIS HC A03/MF A01 CSCL 21C

Sputtering effects in discharge chambers of ion thrusters are lifetime limiting in basically two ways: (1) ion bombardment of critical thruster components at energies sufficient to cause sputtering removes significant quantities of material; enough to degrade operation through adverse dimensional changes or possibly lead to complete component failure, and (2) metals sputtered from these intensely bombarded components are deposited in other locations as thin films and subsequently flake or peel off; the flakes then lodge elsewhere in the discharge chamber with the possibility of providing conductive paths for short circuiting of thruster components such as the ion optics. This experimental work has concentrated in two areas. The first has been to operate thrusters for multi-hour periods and to observe and measure the films found inside the thruster. The second was to simulate the environment inside the discharge chamber of the thruster by means of a dual ion beam system. Here, films were sputter deposited in the presence of a second low energy bombarding beam to simulate film deposition on thruster interior surfaces that undergo simultaneous sputtering and deposition. Mo presents serious problems for use in a thruster as far as film deposition is concerned. Mo films were found to be in high stress, making them more likely to peel and flake. Author

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-18323# SRI International Corp., Menlo Park, Calif.
ORGANOMETALLICS IN HIGH ENERGY CHEMISTRY Final Report, 1 Aug. 1981 - 31 Oct. 1983
Richard M. Laine, Donald A. Levins, and Clifford D. Bedford 31 Oct. 1983 109 p
(Contract DAAG29-81-K-0086)
(AD-A135715; ARO-18084.5-CH) Avail: NTIS HC A06/MF A01 CSCL 19/1

Developed are new synthetic strategies for the synthesis of polymethyleneimine precursors to RDX and HMX through the use of homogeneous catalysts based on ruthenium and; ruthenium and iron mixtures. These catalysts have proved effective for the oligomerization and cyclization of tertiary diaminoalkanes at temperatures and rates superior to the heterogeneous palladium black catalyzed reactions previously reported. Under somewhat different conditions, these same catalysts will cleave reform Si-N bonds. Activation of Si-N bonds has been found useful in several organic syntheses. In an effort to understand why palladium black is less effective than the homogeneous catalysts, an understanding of how Lindlar catalysts function was developed. In addition, a comprehensive picture of how other heterogeneous catalysts especially hydrodenitrogenation catalysts interact with nitrogen containing organics was developed. In unrelated studies, synthetic methods for preparing nitro-alkoxyaluminates with the objective of developing air and moisture stable high energy organometallics were explored. For beta-nitro alkoxy aluminates, air and moisture sensitivity decreases significantly with increasing numbers of beta-nitro groups. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N84-18324*# National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATIONS ON THE SYSTEM BORON-CARBON SILICON
R. Kieffer, E. Gugel, G. Leimer, and P. Ettmayer Dec. 1983 21 p refs Transl. into ENGLISH from Ber. der Deut. Keram. Ges. (West Germany), v. 49, no. 2, Feb. 1972 p 41-46 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77375; NAS 1.15:77375) Avail: NTIS HC A02/MF A01 CSCL 11D

The above elements form with each other binary compounds which are very interesting from the point of view of their structure and their chemistry and which are important for technology, The present investigation is concerned with the three-component system and the behavior of the binary compounds occurring in it. Investigations employing various techniques, such as X-ray, chemical analysis, microscopy and fusion experiments showed that no ternary phase exists within the boundary of the ternary system. There is no compound with a higher abrasion capacity than boron carbide. The probable phase field divisions at two isothermic intersections and the fusion isotherms are indicated. Author

N84-18325*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BUCKLING OF A SUBLAMINATE IN A QUASI-ISOTROPIC COMPOSITE LAMINATE
K. N. Shivakumar (Old Dominion Univ.) and J. D. Whitcomb Feb. 1984 31 p refs
(NASA-TM-85755; NAS 1.15:85755) Avail: NTIS HC A03/MF A01 CSCL 11D

The buckling of an elliptic delamination embedded near the surface of a thick quasi-isotropic laminate was predicted. The thickness of the delaminated ply group (the sublaminate) was assumed to be small compared to the total laminate thickness. Finite-element and Rayleigh-Ritz methods were used for the analyses. The Rayleigh-Ritz method was found to be simple, inexpensive, and accurate, except for highly anisotropic delaminated regions. Effects of delamination shape and orientation, material anisotropy, and layup on buckling strains were examined. Results show that: (1) the stress state around the delaminated region is biaxial, which may lead to buckling when the laminate is loaded in tension; (2) buckling strains for multi-directional fiber sublaminates generally are bounded by those for the 0 deg and 90 deg unidirectional sublaminates; and (3) the direction of elongation of the sublaminate that has the lowest buckling strain correlates with the delamination growth direction. A.R.H.

N84-18326*# Delaware Univ., Newark. Center for Composite Materials.
INFLUENCE OF CONSTITUENT PROPERTIES AND GEOMETRIC FORM ON BEHAVIOR OF WOVEN FABRIC REINFORCED COMPOSITES Semiannual Status Report
R. Byron Pipes and Dale W. Wilson [1984] 10 p refs
(Grant NAG1-378)
(NASA-CR-173326; NAS 1.26:173326) Avail: NTIS HC A02/MF A01 CSCL 11D

Th potential for woven fabric composite forms to increase the interlaminar strength and toughness properties of laminated composite septems is studied. Experimental and analytical studies were performed on a z-axis fabric. S. L.

N84-18327# National Aerospace Lab., Tokyo (Japan).
IN-PLANE SHEAR PROPERTIES OF A FABRIC-CFRP/ALUMINUM-HONEYCOMB SANDWICH CONSTRUCTION
Yoshi Noguchi and Toshiyasu Furuta 1983 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-773) Avail: NTIS HC A02/MF A01

The in plane shear properties of a honeycomb sandwich construction were evaluated by using fabric carbon fiber reinforced plastics (CFRP) as face members. The face material was made of 8 harness satin CFRP, two plies of + or - 45 deg orientation.

The elastic constants and in plane shear strength of the CFRP face members were calculated theoretically. Three sandwich panels were fabricated and loaded in shear by applying tensile load through the diagonally opposite corners of a picture frame test fixture. The calculated results reasonably predict the test results and can provide the same data as when applying CFRP to the face members of sandwich constructions. Author

N84-18328# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DETERMINATION OF THE EFFECT OF STRAIN RATE ON THE MECHANICAL PROPERTIES OF GRAPHITE-EPOXY LAMINATES Final Technical Report, 1 Oct. 1980 - 30 Sep. 1982
James M. Alper 1 May 1983 53 p
(AR00001; ZR02204)
(AD-A136334; NADC-83134-60) Avail: NTIS HC A04/MF A01 CSCL 11/4

The main objective of this program was to experimentally evaluate the effect of strain rate on graphite/epoxy laminates. Specimens representing four laminates ((O)24T, (+ or - 45)12S, (+ or - 45/02)3/90)S, and (+ or - 45/0/+ or 45)2/+ or - 45/90)S) were statically tested in one of two environments, room temperature dry or elevated temperature wet (200 F, 1% moisture content) at strain rates in either tension or compression which yielded failure times of .1 sec, 1 sec, 10 sec, and 100 sec. Results indicate that the laminates are more strain rate sensitive under the elevated temperature wet environment and that laminates typical for Navy aircraft have a statistically significant strain rate effect only under the elevated temperature wet condition. GRA

N84-18329# Tufts Univ., Medford, Mass.
PLASMA MODIFICATION OF GRAPHITE FIBERS AND ITS EFFECT ON COMPOSITE PROPERTIES Final Report, Sep. 1980 - Jun. 1982
G. Dagli and N. H. Sung Aug. 1983 66 p
(Contract DAAG46-80-C-0057; DA Proj. 612105-2571)
(AD-A136558; AMMRC-TR-83-46) Avail: NTIS HC A04/MF A01 CSCL 11/4

A new method is explored to improve mechanical properties of carbon/graphite (C/G) fiber reinforced composites through chemical modification of the fiber surface. C/G fiber surface was altered by plasma polymerization of acrylonitrile. Modified surface was characterized with ESCA, FTIR, SEM, and wetting angle measurements, using a pyrolytic graphite block, as a model surface to C/G fiber. Acrylonitrile plasma treatment permanently changed the graphite surface to a more polar one with a critical surface energy for wetting, gamma c, of 54 dynes/cm. Compared to unmodified fibers, plasma treated C/G fiber resulted in substantial improvements in both interlaminar shear and flexural strengths when incorporated uniaxially in epoxy matrices. GRA

N84-18330# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT AND APPLICATION OF OPTIMIZATION TECHNIQUES FOR COMPOSITE LAMINATES M.S. Thesis
Gerald V. Flanagan Sep. 1983 137 p
(AF Proj. 230-7)
(AD-A135832; AFIT/GAE/AA/83S-4) Avail: NTIS HC A07/MF A01 CSCL 11/4

The design of a composite panel requires some way of finding the minimum thickness laminate which will withstand the load requirements without failure. The mathematical complexity of this problem dictates the use of non-linear optimization techniques. Although there are sophisticated optimization programs available capable of solving for the ply ratios, these programs are not often used in preliminary design because they require a large computer and some knowledge of the program's operation. As an alternative, specialized laminate optimization programs were developed which are compact and efficient enough to run on microcomputers. Only stresses at a point and inplane loads and deflections are considered. The programs are simple to use and require no knowledge of optimization. Techniques are developed in this thesis that find minimum thickness laminates with either ply ratios or ply angles as design variables. In addition, a method is presented for finding the optimimum orientation for the axis of symmetry of an orthotropic laminate. The orthotropic laminate program uses an approximate failure theory, as suggested by Tsai, that has been found to speed computations dramatically. GRA

N84-18331# National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
HYGROTHERMAL EFFECTS IN CONTINUOUS FIBRE REINFORCED COMPOSITES. PART 2: PHYSICAL PROPERTIES
J. P. Komorowski Sep. 1983 64 p
(AD-A135766; NAE-AN-10-Pt-2; NRC-22700-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 11/4

This report is second in a series of literature reviews in which hygrothermal effects on aerospace composite materials (CM) with polymeric matrixes are examined. This report (Part 2) deals primarily with the glass transition temperature and expansion properties due to temperature and moisture. The chapter on residual stresses is also included in this part as these stresses are a direct consequence of the expansion properties. Specific heat, thermal conductivity and emittance are briefly mentioned in Chapter 3.0, while properties connected with moisture absorption have been reviewed extensively in Part 1 of the series. GRA

N84-18332# National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
HYGROTHERMAL EFFECTS IN CONTINUOUS FIBRE REINFORCED COMPOSITES. PART 3: MECHANICAL PROPERTIES 1 - STATIC TESTS
J. P. Komorowski Sep. 1983 59 p
(AD-A135767; NAE-AN-11-Pt-3; NRC-21299-Pt-3) Avail: NTIS HC A04/MF A01 CSCL 11/4

This is Part 3 of a series of literature reviews on hygrothermal effects on polymer matrix composite materials. It contains a review of papers on mechanical properties as measured in static tests and includes the effect of impact damage interaction with environmental conditions. GRA

N84-18333# National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
HYGROTHERMAL EFFECTS IN CONTINUOUS FIBRE REINFORCED COMPOSITES. PART 4: MECHANICAL PROPERTIES 2 - FATIGUE AND TIME-DEPENDENT PROPERTIES
J. P. Komorowski Sep. 1983 63 p
(AD-A135768; NAE-AN-12-Pt-4; NRC-21300-Pt-4) Avail: NTIS HC A04/MF A01 CSCL 11/4

This is part 4 of a series of literature reviews on hygrothermal effects on polymer matrix composite materials. It contains a review of papers on mechanical properties as measured in fatigue, creep or stress relaxation tests with variations in temperature and humidity accounted for in the results. GRA

N84-18334# Universal Energy Systems, Inc., Dayton, Ohio.
SHARP PC-1500 POCKET COMPUTER SOLUTIONS TO STATISTICAL DATA ANALYSIS OF COMPOSITE MATERIALS OR METALS Final Report, Jun. - Oct. 1983
Won J. Park Oct. 1983 27 p
(Contract F33615-82-C-5001; AF Proj. 2307)
(AD-A135086; AFWAL-TR-83-4096) Avail: NTIS HC A03/MF A01 CSCL 09/2

This volume contains the description and instructions of the use of Sharp PC-1500 Pocket Computer for statistical data analysis, in Weibull failure distribution setting, of the strength or fatigue life of composite materials or metals. Instant calculations in maximum likelihood estimates, A and B allowable, S-N curve (linear regression) and prediction can be made for practical use. GRA

N84-18335# Kool View Co., Inc., Madison, Wis.
HONEYCOMB INSULATING SHADE
Aug. 1983 59 p
(Contract FC02-80CS-30525)
(DE84-001270: DOE/CS-30525/25) Avail: NTIS HC A04/MF A01

Effective passive solar heating systems and conventional residential windows which require the incorporation of an operable thermal barrier into the window design are outlined. This product was developed with the following objectives: (1) provides high window insulating value to reduce nighttime Btu losses or excessive daytime heat gain; (2) provides interior comfort; privacy and light control; (3) is cost effective and competitive; (4) is easy to install and operate; and (5) is aesthetically pleasing and adaptable to any decor. The thermal barrier is made of a special nonconductive material formed into a flexible honeycomb structure which is placed on the interior of windows. When expanded it forms multiple dead air spaces that are vertical and parallel to the surface of the glazing interface. The honeycomb cells are dimensionally designed to stop convection from occurring within the cell. When the paper/cloth material is fabricated into a honeycomb structure and placed on the interior of the windows, it forms multiple dead insulating air cells and reduces or stops convection between the window and the honeycomb thermal barrier. The corresponding hardware utilizes conventional curtain traverse rods that are found in the majority of homes or are inexpensively purchased by the consumer. The thermal barrier can be hung on the interior of the window and manipulated by a wand or cord to the open and closed positions. Massive window areas can use motor assisted operation to provide greater efficiency. DOE

N84-18336# Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
FATIGUE-INDUCED AND TIME-DEPENDENT CHANGES IN THERMOMECHANICAL PROPERTIES OF HYBRID COMPOSITE LAMINATES Annual Progress Report
J. Mijovic 1983 18 p
(Grant NSF MEA-81-20311)
(PB84-126333; APR-1; NSF/MEA-83012) Avail: NTIS HC A02/MF A01 CSCL 11D

A project undertaken to address the question of processing-morphology-property-durability relationships in advanced composites is reported. The effect of hygrothermal fatigue on the properties of graphite/epoxy composites was analyzed and the mechanism of moisture diffusion was clarified in terms of the kinetics. Results on the kinetics of cure of epoxy resins of the type used in advanced composites yielded a good agreement between the kinetic rates expression and the experimental results. The exposure of as-processed composites to low pressure led to a large change in their properties as a function of time. Results indicate that the decrease in free volume of resin is followed by the occurrence of additional chemical reactions. GRA

N84-18441# De Beers Diamond Research Lab., Johannesburg (South Africa).
THE CURRENT STATUS OF DIAMOND AND CUBIC BORON NITRIDE COMPOSITES
P. N. Tomlinson and R. J. Wedlake *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 10 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-18337 Overseas Relations Branch Translation Service, London (England).
PROBLEMS ENCOUNTERED IN CONNECTION WITH THE REMOVAL OF SMALL CONCENTRATIONS OF NOXIOUS GASES BY THE USE OF LIQUID ABSORBENTS
V. Fattinger 5 Dec. 1983 17 p refs Transl. into ENGLISH from Swiss Chem. (Switzerland), v. 5, no. 3, 1983 p 27-33
(BLL-OA-Trans-3182-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

The thorough purification of larger inlet air or circulating air streams plays an important role in clean air room engineering. The liquids are used to attain a high degree of purity of the gas stream being treated at minimum cost. Residual or fine absorption is investigated. S.L.

N84-18338*# National Aeronautics and Space Administration, Washington, D. C.
THE DEFINITION OF THE PROCESS OF ELECTROCHEMICAL IMPREGNATION OF NICKEL ELECTRODES
P. Antoine Dec. 1983 196 p Transl. into ENGLISH of "Definition de l'Impregnation Electrochimique des Electrodes de Nickel" rept. ESA-CR(P)-1182 Societe des Accumulateurs Fixes et de Traction, Romainville, France, 1978 p 1-176 Original language document was announced as N79-31370 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77356; NAS 1.15:77356; ESA-CR(P)-1182) Avail: NTIS HC A09/MF A01 CSCL 07D

Electrochemical impregnation was studied during a series of experiments designed to define the optimal conditions for the fabrication of dimensionally stable cell anodes of Ni-H2 and Ni-Cd systems. The influence of various parameters, such as current and duration of electrolysis, temperature and acidity of the chemical bath, the concentrations of Ni and Co as well as the use of ethanol was determined. Results show that the electrochemical impregnation process as defined is industrially feasible and it is suggested that Ni-H2 and Ni-Cd type electrodes be produced in sufficient quantity to further evaluate their performance characteristics. Author

N84-18339*# National Aeronautics and Space Administration, Washington, D. C.
ADSORBENT PHOSPHATES
S. Watanabe Nov. 1983 13 p Transl. into ENGLISH of Japanese Patent no. Showa 46 (1971)-10412 (16 Mar. 1971) 5 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76999; NAS 1.15:76999) Avail: NTIS HC A02/MF A01 CSCL 07D

An adsorbent which uses as its primary ingredient phosphoric acid salts of zirconium or titanium is presented. Production methods are discussed and several examples are detailed. Measurements of separating characteristics of some gases using the salts are given. S.L.

N84-18340*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
ACCURATE EVALUATION OF HOMOGENOUS AND NON-HOMOGENEOUS GAS EMISSIVITIES Final Report, period ending 31 Jul. 1983
S. N. Tiwari and K. P. Lee Jan. 1984 140 p refs
(Grant NAG1-21)
(NASA-CR-173307; NAS 1.26:173307) Avail: NTIS HC A07/MF A01 CSCL 07D

Spectral transmittance and total band adsorptance of selected infrared bands of carbon dioxide and water vapor are calculated by using the line-by-line and quasi-random band models and these are compared with available experimental results to establish the validity of the quasi-random band model. Various wide-band model correlations are employed to calculate the total band absorptance and total emissivity of these two gases under homogeneous and nonhomogeneous conditions. These results are compared with available experimental results under identical conditions. From these comparisons, it is found that the quasi-random band model can provide quite accurate results and is quite suitable for most atmospheric applications. S.L.

N84-18341*# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.

DEVELOPMENT OF A PROTOTYPE EXPERIMENT FOR TREATING CELSS AND PCELSS WASTES TO PRODUCE NUTRIENTS FOR PLANT GROWTH Final Report
31 Dec. 1983 13 p refs Prepared in cooperation with Modar, Inc., Natick, Mass. and Georgia Inst. of Tech., Atlanta
(Grant NsG-2403)
(NASA-CR-173167; NAS 1.26:173167) Avail: NTIS HC A02/MF A01 CSCL 07D

Future long term spaceflights require extensive recycling of wastes to minimize the need for resupplying the vessel. The recycling occurs in a fully or partially closed environment life support system (CELSS or PCELSS). The National Aeronautics and Space Administration (NASA) is interested in converting wastewater into potable water or water for hydroponic farming as part of a CELSS. The development of technologies for wastewater treatment that produce a minimum of by-products is essential. One process that achieves good conversion of moderately concentrated organic wastes in water (1 to 20% by weight) completely to carbon dioxide and water is oxidation in supercritical water. Both air (or oxygen) and many organics are completely miscible with supercritical water, so there are no interphase mass transport resistances that limits the overall oxidation reaction. The temperature of supercritical water, which must be above 374 C, is also sufficient to have rapid reaction kinetics for the oxidations. Author

N84-18342# New Mexico Univ., Albuquerque. Inst. for Modern Optics.
ION BEAM ASSISTED DEPOSITION OF SiO2 Final Report, 1 Apr. - 31 Dec. 1982
John R. McNeil 1983 33 p
(Grant AF-82-0165; AF Proj. 2306)
(AD-A136247; AFOSR-83-1220TR) Avail: NTIS HC A03/MF A01 CSCL 20/7

A Kaufman ion source was modified to produce a low energy (30 eV) high current density (3 mA/sq cm) 0(+) and O2(+) (0(+)/2(+)) ion beam at an optical surface being coated with SiO2. Films of SiO2 were deposited with 0(+)/O2(+) ion bombardment at low energy (30 eV) and at high energy (500 eV). Application of the ion assist technique has the following features: (1) durable coatings can be produced at low substrate temperature; (2) film stoichiometry is improved, particularly for low energy bombardment; (3) hydrogen content of the film is reduced under certain conditions of bombardment; and (4) stress and structure of SiO2 films are not greatly affected by ion bombardment. Author (GRA)

N84-18343# Columbia Univ., New York.
STRUCTURAL AND DYNAMIC STUDIES OF MATERIALS POSSESSING HIGH ENERGY CONTENT Final Technical Report, 1 Nov. 1980 - 31 Oct. 1983
N. J. Turro 31 Oct. 1983 13 p
(Grant AF-AFOSR-0013-81; AF Proj. 2303)
(AD-A136250; AFOSR-83-1216TR) Avail: NTIS HC A02/MF A01 CSCL 07/5

This final report updates and summarizes the research accomplished under this grant during the period of November 1, 1980 through October 31, 1983. We have emphasized investigations in the following areas: photochemical mechanisms through the use of time resolved laser flash spectroscopy; carbenes, radical pairs, ylides, singlet molecular oxygen and other high energy species; detailed and systematic determination of the absolute rate constants for the addition of carbenes to ethylenes; application of weak magnetic fields for controlling the reactivity of radical pairs in colloidal systems; ability of weak magnetic fields to dramatically influence the rate and molecular weights in emulsion polymerization. GRA

N84-18344# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
SYNTHESIS AND CHEMISTRY OF ENERGETIC METALLOTETRAAZADIENES Final Report, 1 Dec. 1982 - 30 Sep. 1983
W. C. Trogler 2 Sep. 1983 5 p
(Grant AF-AFOSR-0021-83; AF Proj. 2303)
(AD-A136269; AFOSR-83-1224TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

New approaches to the synthesis of metallotetraazadienes are described. These include reactions between organic azides and transition metal carbonyl complexes, as well as reactions between metal halide complexes and dilithiated tetrazenes. Attempts to prepare disubstituted tetrazenes by the oxidation of unsymmetrical blocked hydrazines is described. The preparation of super reduced metallotetraazadienes has also been achieved. Author (GRA)

N84-18345# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
COMBUSTION OF AGGLOMERATES FORMED BY CARBON SLURRY FUELS Final Report, Jul. 1982 - Sep. 1983
S. R. Turns, S. P. Riddle, and G. M. Faeth Wright-Patterson AFB, Ohio AFWAL Nov. 1983 102 p
(Contract F33615-82-K-2256; AF Proj. 3048)
(AD-A136390; AFWAL-TR-83-2076) Avail: NTIS HC A06/MF A01 CSCL 21/2

A theoretical and experimental study of the reaction of carbon-black agglomerates, which are formed during the combustion of carbon-black slurry fuels, is reported. Theoretical work includes development of a one-dimensional model of a carbon slurry-fueled combustor in order to gain insight concerning effects of slurry properties and combustor operating conditions on combustor performance. New experiments were also undertaken in order to study effects of carbon-black composition and catalyst loading on agglomerate burning rates. GRA

N84-18346# Yale Univ., New Haven, Conn. Dept. of Chemistry.
HYDROGEN STORAGE BY MOLECULAR POLYHYDRIDES Final Report, 1 Sep. 1980 - 1 Sep. 1983
R. H. Crabtree 1 Nov. 1983 8 p
(Contract DAAG29-80-K-0078)
(AD-A136431; ARO-17456.6-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

Molecular Polyhydrides of the type MHxLy (L=PR3) are examined in connection with the problem of hydrogen storage. Several preparative routes and hydrogen release reactions are studied. Author (GRA)

N84-18347# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
ACOUSTIC SIGNATURE FROM FLAMES AS A COMBUSTION DIAGNOSTIC TOOL Final Technical Report, 1 May 1979 - 31 Oct. 1983
W. C. Strahle Nov. 1983 34 p
(Contract DAAG29-79-C-0087)
(AD-A136447; ARO-15532.4-EG) Avail: NTIS HC A03/MF A01 CSCL 21/2

A program was conducted to investigate the feasibility of using the combustion noise acoustic output as a non-intrusive diagnostic of some details of the combustion process. Investigated were an open premixed turbulent jet flame and a gas turbine combustor converted to run on propane. The analysis links the acoustic pressure fluctuations to the distribution of heat release rate fluctuations. Measurement of the sound field, yields in principle, the heat release rate fluctuation field. It was found, however, that the analytical methods for this inverse problem are too sensitive to small experimental uncertainties. Consequently, it appears that the method is not, in general feasible. GRA

N84-18348# Ben Gurion Univ. of the Negev, Beersheva (Israel).
REACTIONS OF METASTABLE RARE GASES WITH COPPER ATOMS Final Technical Report, 1 Oct. 1979 - 30 Sep. 1982
S. Rosenwaks Nov. 1983 17 p
(Contract DAJA37-80-C-0031)
(AD-A136448) Avail: NTIS HC A02/MF A01 CSCL 07/5

The rate constants for quenching of He(23S) and of Ne, Ar, Kr and Xe in the 3P2 state by copper atoms have been measured at room temperature using a flowing afterglow technique and

found to be 0.93, < 0.2, 1.4, 2.3 and 2.6 x 10 to the minus 10th cu cm/sec, respectively. The rate constants have been measured indirectly applying an internal calibration method in which the copper atoms are used as both quenchers and tracers. It is suggests that the relatively small quenching rate of Ne(3P2) by CU might contribute to its successful use as a buffer gas in the copper-vapor laser. GRA

N84-18349# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
IGNITION AND UNSTEADY FLAME PROPAGATION IN TURBULENT REACTIVE FLOWS Final Report, 10 May 1980 - 31 Oct. 1983
T. Y. Toong Dec. 1983 24 p
(Contract DAAG29-80-C-0123; DA Proj. 1L1-61102-BH-57)
(AD-A136450; ARO-16983.1-EG) Avail: NTIS HC A02/MF A01 CSCL 21/2

A conceptual model was developed for the study of turbulent flame propagation comparison of measured apparent turbulent-flame-propagation speeds with limit curves derived on the basis of this model indicated the importance of rate augmentation within the turbulent flame structure. Spectral changes observed in the thermal structure of premixed methane-air V-flames stabilized behind a cylindrical flameholder indeed showed the existence of reaction-augmented turbulence in the smaller eddies, which would account for the increase in the propagation speeds. Author (GRA)

N84-18350# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
C-h AND h-h ACTIVATION IN TRANSITION METAL COMPLEXES AND ON SURFACES
J. Y. Saillard and R. Hoffman 1983 85 p
(Contract N00014-82-K-0576)
(AD-A136468; TR-1) Avail: NTIS HC A05/MF A01 CSCL 07/4

The breaking of the H-H bond in H2 and a C-H bond in CH4 on both discrete transition metal complexes and on Ni and Ti surfaces is studied, and the essential continuity and similarity of the physical and chemical processes in two cases is demonstrated. We begin with an orbital analysis of oxidative addition, delineating four basic interactions: H-H or C-H sigma M electron transfer the reverse M sigma* transfer (both weakening the sigma bond, forming the M-H bond), a repulsive interaction between sigma and metal filled orbitals, and a rearrangement of electron density at the metal. The molecular cases analyzed in detail are d6 ML5, d8 ML4 and CRhoM'L. Coordinative unsaturation is necessary, and consequently sigma M electron transfer dominates the early stages of the reaction. Steric effects are important for CH4 reaction. Activation in angular ML4 or CpM L is achieved through a destabilized yz MO, and d10 ML3, ML2 candidates for activation are described. For our study of the surface we develop tools such as projections of the density of states and crystal orbital overlap populations - the extended structure analogues of a population analysis. These allow a clear understanding of what happens when an H2 or a CH4 molecule approaches a surface. Because of the higher energy of the occupied metal orbitals on the surface the M sigma* interaction leads the reaction. There are great similarities and some differences between the activation acts in a discrete complex and on a surface. Author (GRA)

N84-18351# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MASS SPECTROMETRY DETECTION OF NEUTRAL DISSOCIATIVE FRAGMENTS M.S. Thesis
M. E. Wunderlich Dec. 1982 52 p
(AD-A135847; AFIT/GEP/PH/82D-27) Avail: NTIS HC A04/MF A01 CSCL 07/4

The feasibility of detecting neutral fragments from molecular dissociative processes has been investigated using a mass spectrometer. The mass spectrometer is equipped with dual ionizers. One ionizer is used to form neutral and ionic dissociation fragments. The neutral fragments proceed to the second ionizer for ionization and subsequent detection. The difference in the measured signal when the first ionizer is on or off will reveal information on the formation of neutrals as a function of electron energy. This study concentrates on the detection of the neutral nitrogen (N) and hydrogen (H) fragments from molecular nitrogen (N2) and hydrogen (H2). No measurable experimental results from the two step, dissociation then ionization, process were obtained using the current experimental apparatus. The angular distribution of the dissociative fragments and the type and geometry of the apparatus prove to be important aspects which must be considered when detecting neutral fragments. Recommendations are given which may improve the possibility of detecting neutral fragments using this technique. Author (GRA)

N84-18352# Oregon State Univ., Corvallis. Dept. of Physics.
PHASE TRANSFORMATION STUDY OF Cu2S Interim Report
J. A. Gardner, D. K. Gaskill, M. Hirscher, H. Jaeger, and K. S. Krane 1 Sep. 1983 11 p
(Contract N00014-79-C-0668)
(AD-A135587; TR-4) Avail: NTIS HC A02/MF A01 CSCL 07/4

The phase transformations of crystalline Cu2S in the temperature range 50 C to 600 C have been studied through electric quadrupole interactions studied through electric quadrupole interactions of 111Cd impurities observed by time-differential perturbed angular correlations. The Cd is subject to no discernable quadrupolar interaction in the cubic phase above 430 C. In the hexagonal phase between approximately 103 C and 430 C, a single-site, weakly temperature dependent, axially symmetric quadrupolar interaction is found. At lower temperature, the structure is complex with a number of different sites. These data were taken with a microcomputer-controlled TDPAC spectrometer with logical steering that allows a standard 4-detector spectrometer to collect simultaneously 12 channels of data. Author (GRA)

N84-18353# Oregon State Univ., Corvallis.
TDPAC (TIME DIFFERENTIAL PERTURBED ANGULAR CORRELATIONS) STUDY OF LIQUID AND AMORPHOUS se SUB (1-x)Te SUB x ALLOYS Interim Report
D. K. Gaskill, J. A. Gardner, K. S. Krane, and R. L. Rasera 10 Nov. 1983 17 p
(Contract N00014-79-C-0668)
(AD-A135588; TR-5) Avail: NTIS HC A02/MF A01 CSCL 07/4

A time differential perturbed angular correlation study on several liquid and amorphous splat-quenched Se sub (1-x)Te sub x alloys was performed using dilute 111Cd as the tracer. The liquid spectra exhibits an attenuation factor, Lambda 22, consistent with the motional narrowing approximation. The attenuation factor is proportional to the motional correlation time tc, multiplied by the average square electric quadrupole frequency, NUQ2. NU sub Q has been characterized in amorphous splat-quenched Se and Te, allowing tc to be computed for these two liquids from the measured Lambda 22. Spectra in both amorphous Se and Te arise from two distinguishable sites with quadrupole frequencies similar to the sites in compounds of Se or Te with In. GRA

N84-18354# AeroChem Research Labs., Inc., Princeton, N. J.
PROTOTYPE CHEMILUMINESCENT ANALYZER FOR MEASUREMENT OF HYDRAZINES AND NITROGEN DIOXIDE Final Report, 21 Sep. 1981 - 30 Mar. 1983
H. N. Volltrauer Oct. 1983 20 p
(Contract F33615-81-C-0621; AF Proj. 7930)
(AD-A135622; AEROCHEM-TP-429; SAM-TR-83-35) Avail: NTIS HC A02/MF A01 CSCL 07/4

Five prototype instruments have been built which will measure concentrations of hydrazine, monomethylhydrazine, and unsymmetrical dimethylhydrazine in the range of 0.05 to 100 ppm in air, and nitrogen dioxide in the range of 1 to 100 ppm in air. The performance of the instruments is described, and tests results are given. Author (GRA)

N84-18355# Thiokol Chemical Corp., Marshall, Tex.
RESONANCE LINE BROADENING OF ALKALI METALS IN PYROTECHNIC FLAMES Ph.D. Thesis
D. R. Dillehay 15 Apr. 1983 116 p
(AD-A135685) Avail: NTIS HC A06/MF A01 CSCL 21/2

A mathematical model of a pyrotechnic flame has been

developed and validated. The model utilizes a computer program to calculate the relative radiant power of flares containing any of the alkali metals. The computation takes into consideration known system variables such as formulation, candle size, displacement along the plume axis, and atmospheric pressure. These effects were evaluated over a wide range of conditions and the computed spectra follow the established experimental spectra trends. The computer solution is a general solution requiring no ad hoc modifications to the model for any of the metals or conditions tested. The basis for the model of the flame permits calculation of the effects of mixing of the flare plume with the ambient atmosphere and takes heat loss along the plume axis into consideration. GRA

N84-18356# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
STUDY OF THE CHARACTERISTICS OF HIGH PRESSURE PROPORTIONAL COUNTERS FOR THE DETECTION OF RADIOACTIVE GASES M.S. Thesis
Jeffrey J. Knapp Mar. 1983 107 p
(AD-A135803; AD-E401101; AFIT/GNE/PH/83M-8) Avail: NTIS HC A06/MF 01 CSCL 07/5

This report presents a study of the design and operating characteristics of high pressure proportional counters for the detection of radioactive noble gases. The analysis was limited to those radioisotopes of xenon, 131mXe and 133Xe, which are produced in nuclear fission. The detector may be utilized for the identification of the radionuclide 133Xe through conversion electron analysis. A sample of 133Xe was measured at 41 atmospheres using xenon as the counting gas; the resolution (FWHM) for the 45 keV conversion electron and 75.6 keV sum peak were found to be 5.9 keV and 7.0 keV respectively. The extreme sensitivity of noble gases to electronegative impurities was also found; a periodic or perhaps continuous purification of the counting gas may be required for stable and reproducible resolution. Recommendations were made for further study. Author (GRA)

N84-18357# Army Armament Research and Development Command, Dover, N. J.
CARS STUDIES OF NITRAMINE LOVA PROPELLANT COMBUSTION Final Report
Kenneth Aron (Geo-Centers, Inc., Newton, Mass.) and L. E. Harris Nov. 1983 32 p
(Contract DAAK10-81-C-0266)
(AD-A135813; AD-E401101; ARLCD-TR-83045) Avail: NTIS HC A03/MF A01 CSCL 19/1

Coherent anti-Stokes Raman scattering (CARS) spectroscopy was used to probe the nitramine LOVA flame, burning unconfined in the air. Several spectral regions were scanned in an attempt to document the transient species of the RDX combustion for use in determining decomposition mechanisms. GRA

N84-18358# Ohio State Univ., Columbus. Research Foundation.
ELECTROCATALYSIS OF OXYGEN USING WATER SOLUBLE METAL PORPHYRINS AND CHEMICALLY MODIFIED PORPHYRIN ELECTRODES Final Report, 1 Sep. 1978 - 31 Mar. 1983
Theodore Kuwana 1 Nov. 1983 16 p
(Grant AF-AFOSR-3672-78; AF Proj. 2303)
(AD-A136062; AFOSR-83-1097TR) Avail: NTIS HC A02/MF A01 CSCL 07/2

Primary effort was devoted to the study of oxygen reduction using water soluble iron and cobalt porphyrins, namely, iron and cobalt tetrakis (N-methyl-4-pyridyl)porphyrin. These porphyrins with the metal in the +3 oxidation state can be electrochemically reduced to the divalent state which can then react with oxygen. In the case of the iron containing porphyrin, oxygen was reduced at a bimolecular rate of ca. 1 x 10 to the minus 7th power 1/m/s to hydrogen perioxide which was then reduced rapidly to water. A mechanistic scheme was postulated for the reduction and using experimentally determined parameters, current-potential curves were simulated. Good agreement between the experimental and computer calculated current-potential curves supported the proposed scheme. Cross-correlation between optical, electrochemical and magnetic circular dichroism results have provided axial ligation, dimerization and spin state information of the ferric and ferrous tetrakis (n-methyl-4-pyridyl)porphyrins. Glassy or graphitic carbon electrodes were rendered catalytic by the incorporation of iron porphyrin derivatives infinity iron, e.g., iron tetra-(o-aminophenyl)porphyrin and iron tetra-(N(2-hydroxyethyl)pyridyl)porphyrin summation in thin polymeric films adhering to the carbon. The extent of oxygen reduction to hydrogen peroxide and water depended on the amount of iron porphyin. GRA

N84-18359# Lehigh Univ., Bethlehem, Pa.
SYMPOSIUM ON ADVANCED METHODS OF CATALYST CHARACTERIZATION, NOVEMBER 1-2, 1982
K. Klier 18 May 1983 24 p
(Grant N00014-82-G-0093)
(AD-A136209) Avail: NTIS HC A02/MF A01 CSCL 07/4

The objective of the symposium was to present, discuss, and evaluate the most advanced state-of-the-art methods that can be used for the characterization of heterogeneous catalysts down to atomic and molecular level. The 30 presented papers covered applications of very high resolution transmission (TEM); and scanning transmission (STEM) electron microscopy, in situ TEM studies, and high resolution analytical STEM; characterization and preparation of metal clusters and encapsulation of small particles; spectroscopic studies of catalysts and their surfaces, particularly solid state spin-echo and magic angle spinning NMR, Fourier transform infrared, including beam deflection spectroscopy, EXAFS, SIMS, ISS, and Mossbauer spectroscopic investigations. The Symposium program and abstracts are attached in Appendix I. Fifteen full papers will appear, along with the abstracts, in a late 1983 issue of the Journal of Molecular Catalysis. The Symposium was international in scope, with six foreign speakers from the United Kingdom, Netherlands, and Mexico. GRA

N84-18360# Duke Univ., Durham, N. C. Lab. for Chemistry.
STUDIES IN BORON CHEMISTRY Final Report, 1 Jul. 1980 - 30 Sep. 1983
B. F. Spielvogel and A. T. McPhail 15 Nov. 1983 4 p
(Contract DAAG29-79-D-1001)
(AD-A135364; ARO-17650.5-CH) Avail: NTIS HC A02/MF A01 CSCL 06/15

The exploration of the synthesis and characterization of isoelectronic and isostructural boron analogs of the alpha-amino acids, their precursors, and derivative was continued during this period. The boron analogs are very weak acids with pK1 approximately 8. They exhibit significant anti-arthritic, hypolipidemic, and antitumor activity. The chemistry and activity has been described in publications 1 to 9 and in patents and patent submissions 1 to 5. GRA

N84-18361# Oak Ridge National Lab., Tenn. Information Div.
GUIDE TO THE BIBLIOGRAPHIC FORMAT USED BY THE CARBON DIOXIDE INFORMATION CENTER
L. J. Allison and H. A. Pfuderer Dec. 1983 61 p refs
(Contract W-7405-eng-26)
(DE84-004109; ORNL/CDIC-6) Avail: NTIS HC A04/MF A01

Guidelines for the preparation of material to be entered into the Carbon Dioxide Information Center's Bibliographic Information System (CDIC/BIS) are presented. Literature is included in a computerized information file and has a number of identifying characteristics or descriptors. The descriptor fields currently used by the CDIC/BIS are alphabetically listed and are defined. Many examples are included to illustrate some of the variations that might be encountered. DOE

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-18362 British Library Lending Div., Boston Spa (England).
MECHANICAL PROPERTIES OF Mn-Al-C SYSTEM ALLOYS

A. V. Shangurov (Urals Polytechnical Inst.), M. A. Uimin (Urals Polytechnical Inst.), A. E. Ermakov (Urals Polytechnical Inst.), V. L. Kolmogorov (Urals Polytechnical Inst.), A. A. Shchipanov (Urals Polytechnical Inst.), and S. P. Burkin (Urals Polytechnical Inst.) [1983] 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 4, 1983 p 47-50
(BLL-M-35432) Avail: British Library Lending Div., Boston Spa, Engl.

It was found that Mn-Al-C alloys with different carbon contents behave anomalously as regards deformation resistance. The alloys soften during upsetting at 750 C and a loading speed of 10 mm/min. The nature of the softening curve depends on the chosen methods of heat-treatment. The representative yield strength is a function of the deformation rate and the deformation temperature, the lower the former and the higher the latter, the lower the yield strength. Within the ranges of variation in carbon content and preliminary heat-treatment parameters studied, the effect of these factors on the deformation resistance of the alloys is only slight. Author

N84-18363 British Library Lending Div., Boston Spa (England).
MARTENSITIC TRANSFORMATIONS, RELAXATION AND ACOUSTIC-EMISSION PROPERTIES OF SOME ALLOYS OF THE Fe-Ni-Mn SYSTEM
B. A. Apaev, B. I. Voronenko, V. F. Zemlyanikin, and S. A. Madyanov [1983] 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 4, 1983 p 77-81
(BLL-M-35434-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

It is shown that in a thermal alloys, austenite has a greater tensile strength and a lower ductility as compared with isothermal alloys. The effects of an acoustic emission above the martensite points are observed. A considerable difference is established in the form of the martensite curves obtained by thermomagnetic and acoustic emission methods. Author

N84-18364 British Library Lending Div., Boston Spa (England).
STABILIZATION OF THICKNESS OF ZINC COATING BY ADAPTIVE SYSTEM OF CONTROL
V. E. Eremin, M. R. Kosmynina, G. M. Popov, and E. V. Kalinin [1983] 7 p Transl. into ENGLISH from Stal (USSR), no, 2, 1983 p 48-56
(BLL-M-35367-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

An adaptive system for controling the coating thickness for use in continuous hot galvanizing plants is developed. The system can be implemented with standard analogue instruments and the use of microprocessor techniques. Industrial Implementation demonstrates that the system operates reliably and ensures that a uniform coating thickness not exceeding 4 microns is produced. The reduction in zinc consumption is 2.3 kg/t. Author

N84-18365 British Library Lending Div., Boston Spa (England).
GRAIN SIZE IN SINTERED SAMARIUM-COBALT ALLOYS AND THEIR COERCIVE FORCE
Ya. L. Linetskii (Moscow Steel and Alloys Inst.) and A. N. Savich (Moscow Steel and Alloys Inst.) [1983] 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb, Zaved. Chern. Met. (USSR) p 154
(BLL-M-35406(5826.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The coercive force of samarium-cobalt alloys sintered at different temperatures is briefly considered in relation to grain size and defectiveness, and equations are given. Author

N84-18366 Overseas Relations Branch Translation Service, London (England).
ELECTROPLATED METAL COATINGS PRODUCED BY FUSED SALT ELECTROLYSIS
P. Kunz 28 Nov. 1983 13 p refs Transl. into ENGLISH from Oberflaeche-Surface (West Germany), v. 23, no. 23, 1982 p 311-314
(BLL-OA-Trans-3140-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

Fused salt melts may replace water as solvent in electroplating. By reason of the specific properties of such melts and their operating conditions such electrolytes may offer advantages over aqueous systems. Descriptions are given of industrial scale applications including the deposition of ductile platinum films from cyanide salt melts and the deposition of tantalum films from fluoride salt melts. Author

N84-18367 Overseas Relations Branch Translation Service, London (England).
THE EVAPORATION OF IRON AND ITS ALLOYING ELEMENTS, COPPER AND MANGANESE, UNDER REDUCED PRESSURE USING THE LEVITATION MELTING TECHNIQUE
W. A. Fischer, D. Janke, and K. Stahlschmidt 7 Nov. 1983 20 p Transl. into ENGLISH from Arch. Eisenhuettenwesen (West Germany), v. 45, no. 11, Nov. 1974 p 757-764
(BLL-OA-Trans-3117-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

A levitation melting facility for the noncrucible melting of metals in a controlled gas atmosphere is described. The evaporation of iron and its alloying elements, copper and manganese, from steel of the type x 5 CrNi 189 at pressures between 760 and 0.05 mmHg and melting temperatures between 1760 and 1930 C was studied. Results are interpreted using an equation developed for the diffusion of metal vapor through a laminar flow boundary layer. Findings for evaporation under reduced pressure in the levitation melting facility and in vacuum induction furnaces are compared. Conclusions relating to the creation of optimum conditions for removing copper from steel baths are presented. A.R.H.

N84-18368 Overseas Relations Branch Translation Service, London (England).
METHOD FOR FORMING AN INSULATING FILM ON ELECTROMAGNETIC STEEL SHEET
7 Nov. 1983 7 p Transl. into ENGLISH of Japanese Patent no. 55(1980)-133512 (24 Sep. 1983)
(BLL-OA-Trans-3124-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

A method for forming an insulating film on an electromagnetic steel sheet is described. The electromagnetic steel is produced by an ultrarapid quenching method and an insulating film is formed on the electromagnetic steel sheet during the manufacturing process itself. S.L.

N84-18369 Overseas Relations Branch Translation Service, London (England).
A MELT FOR ELECTROLYTIC TUNGSTEN PLATING
2 Dec. 1983 7 p refs Transl. into ENGLISH of Russian Patent no. 827611 (17 May 1979)
(BLL-OA-Trans-3160-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

The process temperature for the electrodeposition of tungsten coatings is reduced (140 to 180 C) in order to reduce the probability of disruptions in the structure of the substrate as well as the nonproductive consumption of electric energy in heating the electrolyte. A carbamide with a weight % of 93 to 97 is added to a melt containing 2 to 5 weight % of tungstenate of an alkali or alkali-earth metal, and 1 to 2 weight % of ammonium chloride. The carbamide represents the base of the melt and a complex-forming agent, whereas the ammonium chloride increases the electrical conductivity of the melt and the stability of the carbamide. High quality finely crystalline coatings with satisfactory adhesion are obtained. A.R.H.

N84-18370*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF THERMOELECTRIC PROPERTIES OF HIGH-TEMPERATURE COMPLEX ALLOYS OF NICKEL-BASE, IRON-BASE AND COBALT-BASE GROUPS
Raymond Holanda Jan. 1984 23 p refs

(NASA-TP-2278; E-1854; NAS 1.60:2278) Avail: NTIS HC A02/MF A01 CSCL 11F

The thermoelectric properties alloys of the nickel-base, iron-base, and cobalt-base groups containing from 1% to 25% 106 chromium were compared and correlated with the following material characteristics: atomic percent of the principle alloy constituent; ratio of concentration of two constituents; alloy physical property (electrical resistivity); alloy phase structure (percent precipitate or percent hardener content); alloy electronic structure (electron concentration). For solid-solution-type alloys the most consistent correlation was obtained with electron concentration, for precipitation-hardenable alloys of the nickel-base superalloy group, the thermoelectric potential correlated with hardener content in the alloy structure. For solid-solution-type alloys, no problems were found with thermoelectric stability to 1000; for precipitation-hardenable alloys, thermoelectric stability was dependent on phase stability. The effects of the compositional range of alloy constituents on temperature measurement uncertainty are discussed. A.R.H.

N84-18371# National Bureau of Standards, Boulder, Colo. Fracture and Deformation Div.

EFFECTS OF VARIATIONS IN HEAT TREATMENT ON THE MECHANICAL PROPERTIES AND MICROSTRUCTURE OF ASTM A710 GRADE A CLASS 3 STEEL Final Report

G. E. Hitcho, L. C. Smith, S. Singhal, and R. J. Fields May 1983 91 p

(Contract N00167-82-MP-00032; F61-541)

(AD-A136328; DTNSRDC/SME-CR-22-83) Avail: NTIS HC A05/MF A01 CSCL 11/6

A final report assessing the effects of variations in heat treatment on the mechanical properties and microstructure of ASTM A710 grade A class 3 steel is given. The goal of this project was to evaluate the sensitivity of the mechanical properties of A710, an age hardening steel, to heat treatment variations that may occur in the production of thick plate. Tensile and impact tests were conducted on the material heat treated under the various conditions. Microstructure evaluations using optical and electron metallographic methods were conducted. Small angle neutron scattering examinations were also performed on selected specimens in order to evaluate the precipitate distribution. Results indicate that austenitization and aging time has little effect on the resultant mechanical properties. However, the mechanical properties were found to be sensitive to aging temperature. Impact results at 0 F indicate that aging at 900 F is detrimental in that the fracture surfaces of the broken impacts exhibited cleavage. Furthermore, the results suggest that welding or similar heating operations will not seriously degrade this material's properties. GRA

N84-18372# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

ELECTRICAL TRANSPORT IN LOW RESISTIVITY AMORPHOUS ALLOYS Final Report

L. V. Meisel and P. J. Cote Sep. 1983 41 p Presented at the Am. Phys. Soc., Mar. 1983

(AD-A136331; ARLCB-TR-83032) Avail: NTIS HC A03/MF A01 CSCL 11/6

Diffraction model calculations incorporating appropriate scattering matrix elements and phonon ineffectiveness effects (saturation effects) yield results which are consistent with the observed temperature dependence of the electrical resistivity in low resistivity (Rho < or = 100 micro ohms/cm) amorphous alloys. In particular, remarkably good quantitative agreement with available detailed resistivity measurements in a-MgZn alloys has been obtained by these methods. The results further indicate that saturation effects, which dominate the temperature dependence of the high resistivity amorphous metals, are important even for resistivities as low as 50 micro ohms/cm. GRA

N84-18373# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

ATOMIC TRANSPORT IN METALLIC GLASSES Interim Report

R. C. Cammarata, A. L. Greer, F. Spaepen, and S. S. Tsao Nov. 1983 39 p

(Contract N00014-77-C-0002)

(AD-A136363; TR-24) Avail: NTIS HC A03/MF A01 CSCL 11/6

The viscosity of glassy Pd77.5Cu6Si16.5 near Tg has bimolecular relaxation kinetics. A new determination of the equilibrium is reported, which is an order of magnitude higher than literature values. The iso-configurational temperature dependence is found to depend on thermal history. Diffusion measurements in compositionally modulated films have been made. Reported here are: iso-configurational diffusivities, relaxation kinetics, and modulation wavelength dependence. The existence of a gradient energy coefficient in metallic glasses has been established. The diffusivity is about two orders of magnitude higher than the predictions of the Stokes-Einstein relation from the viscosity. GRA

N84-18374# Northeastern Univ., Boston, Mass. Inst. of Chemical Analysis and Materials Science.

ALLOY DEVELOPMENT, PROCESSING AND CHARACTERIZATION OF DEVITRIFIED TITANIUM BASE MICROCRYSTALLINE ALLOYS Annual Report, Sep. 1982 - Aug. 1983

Sung H. Whang Dec. 1983 90 p

(Contract N00014-82-K-0597)

(AD-A136589) Avail: NTIS HC A05/MF A01 CSCL 11/6

New syntheses of devitrified Ti alloys as well as rapidly solidified microcrystalline Ti alloys have been made using novel additive elements (B, Si, Y, La Ce, etc.) and rapid quenching techniques. The glass forming property of binary and ternary alloys systems has been studied using a model based on a phenomenological approach. The extended solid solubility of the additives were determined by TEM. The microstructures of the DV as well as RS microcrystalline alloys have been investigated by AEM with respect to heat treatment conditions. The crystal structure, morphology and coarsening kinetics of the precipitate resulting from the heat treatment in the synthesized alloys have been studied by TEM, SEM, STEM, X-ray, EDXS and ELS. Mechanical properties such as microhardness and bend ductility were measured on the samples heat treated isothermally as well as isochronally. From the results, microstructure-mechanical property relationships have been found. Author (GRA)

N84-18375# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE HIGH TEMPERATURE VISCOPLASTIC FATIGUE BEHAVIOR OF IN-100 USING THE BODNER-PARTOM FLOW LAW M.S. Thesis

R. E. Wilson Sep. 1983 113 p

(AD-A135867; AFIT/GAE/AA/83S-6) Avail: NTIS HC A06/MF A01 CSCL 11/6

Few studies have been made on the stress/strain field or plastic zone size ahead of a crack tip in a high temperature environment under varying load frequencies and stress levels. Fewer studies have incorporated compressive loads or analyzed the effect of a negative R-ratio on the fatigue characteristics of the superalloy IN-100. This study involves extending existing analysis of the stress field and plastic zone ahead of a crack tip in a compact tension specimen, through a larger number of load cycles and examining the nearly unexplored area of compressive loading of a crack in a superalloy. A USAF Materials Laboratory finite element computer program named VISCO was used for this study. The Bodner-Partom viscoplastic constitutive equations for describing the material behavior were utilized. Load spectra included various frequencies with R-ratios of 0.1 and -1.0 (zero mean load). Author (GRA)

N84-18376# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

IRON AND STEEL (SELECTED ARTICLES)

W. Liangzhu, Y. Yongning, and G. Yiping 9 Nov. 1983 24 p Transl. into ENGLISH from Gangtie (China), v. 18, no. 2, Feb. 1983 p 58-65, 76-77

(AD-A135576; FTD-ID(RS)T-1411-83) Avail: NTIS HC A02/MF A01 CSCL 11/6

Technologies developed in Sweden for the production of sponge iron by plasma heating are described as well as the revolving furnace smelting method developed in Germany which uses coal powder as the energy source. Highlights of a conference on powder metallurgy held in China are included. A.R.H.

N84-18377# Army Tank-Automotive Command, Warren, Mich.
CHARACTERIZATION OF SELECTED PROPERTIES FOR ALUMINA-ALUMINUM METAL MATRIX COMPOSITES Final Report, May 1982 - Feb. 1983
T. J. Kler and D. T. Ostberg Sep. 1983 27 p
(DA Proj. 1L1-62601-AH-91)
(AD-A135580; TACOM-TR-12763) Avail: NTIS HC A03/MF A01 CSCL 11/6

Alumina-Aluminum Metal Matrix Composite Material, known by the trade name Fiber FP/Aluminum and manufactured by E.I. DuPont DeNemours, was evaluated for the following selected properties: Microstructural integrity, tensile strength, fatigue life, charpy impact resistance, and abrasion resistance. The Fiber FP/Aluminum was examined as a possible material alternative for track component application. Author (GRA)

N84-18378# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
DEFORMATION AND FRACTURE OF P/M TITANIUM ALLOYS Annual Report, 1 Oct. 1982 - 30 Sep. 1983
D. A. Koss 15 Nov. 1983 18 p
(Contract N00014-76-C-0037)
(AD-A135612; TR-23) Avail: NTIS HC A02/MF A01 CSCL 11/6

Progress is reviewed for a research program which is examining selected processing-microstructure-property relationships which limit the mechanical properties of P/M Ti alloys in particular and aspects of ductile fracture in general. The approach is quite broad and ranges from experimental and analytical studies of the effect of porosity on the fracture of engineering alloys to be an experimental examination of the hot isostatic pressing of metallic powders. Progress for the period 10/1/82-9/30/83 is reviewed for the following aspects of this research program: the tensile deformation and fracture of alloys containing porosity; experiment and modeling of P/M titanium alloys; the influence of strain-rate on the flow and fracture behavior of titanium and nickel containing porosity; a modeling study of the influence of void distributions on the mechanism of ductile fracture; hot isostatic pressing of metallic powders; and the influence of plastic anisotropy on the hydrogen embrittlement of titanium under multiaxial states of stress. GRA

N84-18379# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.
SYNTHESIS AND PROPERTIES OF ELEVATED TEMPERATURE P/M ALUMINUM ALLOYS Annual Technical Report, 1 Oct. 1982 - 30 Sep. 1983
M. E. Fine and J. R. Weertman 29 Nov. 1983 47 p
(Grant AF-AFOSR-0005-82; AF Proj. 2306)
(AD-A135956; AFOSR-83-1202TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

High temperature alloys in order to maintain their strength during long time exposure at high temperatures must have stable microstructures. The dispersed phase coarsening rates in the Al-7.5Fe-3.5Ce and Al-10Fe-1.5Mo-1V alloys, developed for high temperature applications, were compared at 475 and 575 C. To the extent that the average intercept length cubed, L3, is a linear function of time during isothermal aging, after an initial transient, the particle coarsening obeys the Lifshitz-Slyozov-Wagner theory. The interfacial energies estimated from the coarsening rates using the theory of particle coarsening show that the interfaces between the particles and matrix are high energy incoherent interfaces. The dispersed particles in the Al-10Fe-1.5Mo-1V alloy coarsen faster at both temperatures than the particles in the Al-7.5Fe-3.5Ce showing that the latter alloy is more stable at these temperatures. Since the diffusion in diffusion controlled coarsening usually occurs by a vacancy mechanism, plastic deformation should increase the rate of particle coarsening since plastic deformation increases the vacancy concentration. This has been confirmed in combined creep and coarsening studies with the Al-7.5Fe-3.5Ce alloy. GRA

N84-18380# National Bureau of Standards, Washington, D.C. Metallurgy Div.
APPLICATION OF SOLIDIFICATION THEORY TO RAPID SOLIDIFICATION PROCESSING Semiannual Technical Report, 1 Apr. - 30 Sep. 1982
W. J. Boettinger, J. W. Cahn, S. R. Coriell, J. R. Manning, and R. J. Schaefer Jul. 1983 70 p
(ARPA Order 4526; ARPA Order 3751)
(AD-A135982) Avail: NTIS HC A04/MF A01 CSCL 11/6

The objective of this work is to develop guidelines based on kinetic and thermodynamic solidification theory for prediction and control of rapid solidification processes. In particular, segregation effects and rules governing the formation of equilibrium and non-equilibrium phases, including metallic glasses, will be investigated. Areas where significant improvements in alloy properties can be produced by rapid solidification will be emphasized. GRA

N84-18381# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF THE OVERLOAD RATIO ON FATIGUE GROWTH BEHAVIOR IN TI-6AL-4V
O. Jie, S. Deyu, and Y. Minggao 17 Nov. 1983 23 p Transl. into ENGLISH from Hangkong Cailiao Yanjiusuo (China), v. 2, no. 1, Jun. 1982 p 12-14; 31-39
(AD-A136027; FTD-ID(RS)T-1578-83) Avail: NTIS HC A02/MF A01 CSCL 11/6

The effects of different overload ratios on the fatigue crack growth processes and rates of crack growth in the titanium alloy TC sub 4 are discussed. The law of the overload retardation which changes with the changes of the overload ratio is discussed. A diagram of the process and mechanism of the overload retardation fatigue crack growth mechanism is given, as well as an empirical relational formula to calculate both the maximum plastic strain of the overload crack tip and crack tip growth life lengthened because of overloading. R.J.F.

N84-18382# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF TRANSFORMED BETA MORPHOLOGY AND OTHER STRUCTURAL FEATURES ON MECHANICAL PROPERTIES IN TI-6AL-4V
C. Chunxiao, W. Jinyou, and S. Quiqin 18 Nov. 1983 19 p Transl. into ENGLISH from Hankong Cailiao Yanjiusua (China), v. 1, no. 1, Jun. 1981 p 1-7
(AD-A136028; FTD-ID(RS)T-1576-83) Avail: NTIS HC A02/MF A01 CSCL 11/6

A study of the relations between the alloy structure of Ti-6Al-4V and its characteristics shows that its tensile ductility, fatigue strength (high cycle and low cycle fatigue), fracture toughness, creep resistance, and other characteristics are not only determined by whether it is an acicular structure or an equiaxed structure, but also depend on the primary alpha percentage, the original beta grain size, the transformed beta morphology, and other conditions. Among these conditions, the transformed Beta structure morphology is especially an important factor. With respect to one property, the acicular structure is superior to the equiaxed structure under one condition. However, under another condition, the former may be close to or poorer than the latter. Therefore, it is impractical to compare these two types of structures in general. A comparison of the overall characteristics shows that, among all the structures mentioned, the basketweave structure is the optimum and the aligned structure is the worst. R.J.F.

N84-18383# Polytechnic Inst. of New York, Brooklyn.
FATIGUE CRACK PROPAGATION IN TI-Mn ALLOYS: THE ROLE OF THE BAUSCHINGER EFFECT Final Technical Report
Harold Margolin and Jong-Soo Park 1 Mar. 1983 30 p
(Grant AF-AFOSR-0028-79; AF Proj. 2036)

(AD-A136036; AFOSR-83-1198TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The work on this program consisted of three parts: study of fatigue crack propagation behavior of alpha-beta Ti-Mn alloys; rationalization of the role of microstructure in the fracture toughness of the alpha-beta alloy Ti-5.25Al-5.5V-0.9//Fe-0.5Cu; and an examination of slip transfer from alpha - beta. A summary of the achievements in each of these areas and pertinent additional information will be given in the following presentation. GRA

N84-18384# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.

FATIGUE LIFE ANALYSIS AND TENSILE OVERLOAD EFFECTS WITH HIGH STRENGTH STEEL NOTCHED SPECIMENS Final Technical Report

J. H. Underwood Nov. 1983 26 p Presented at IX AIRAPT Intern. High Pressure Conf., Albany, 27-28 Jul. 1983

(AD-A136065; ARLCB-TR-83040) Avail: NTIS HC A03/MF A01 CSCL 11/6

Fatigue crack growth results are presented for a series of tests of high strength steel notched-bending specimens. Eight values of stress concentration factor from 1.5 to 4 were represented in the tests, as well as six forging procedures with yield strengths from about 1000 to 1200 MPa. The cyclic lives of the specimens, ranging from about 2000 to 100,000 cycles, were analyzed, using fatigue stress range calculated from stress concentration factor and from a fracture mechanics method. A statistical comparison of the two methods was performed. Photoelastic and finite element methods were used to obtain some of the notch root stresses. The effects of a single prior tensile overload on fatigue life were considered for many of the tests. There appeared to be critical ratio (about unity) of cyclic stress range at the notch root relative to yield strength, below which a tensile overload extended fatigue life and above which a tensile overload shortened life. The effects of prior thermal overload on fatigue life were also investigated in five tests of two specimen geometries. Rapid cooling of the outer diameter of a hollow disk segment of a cylinder extended the fatigue life in subsequent cyclic bending testing of the segment. GRA

N84-18385# Johns Hopkins Univ., Baltimore, Md. Center for Materials Research.

PRECIPITATION IN RAPIDLY SOLIDIFIED Al-Mn ALLOYS Progress Report

D. Shechtman, E. Horowitz, R. J. Schaefer (NBS), and F. S. Biancaniello (NBS) Aug. 1983 37 p

(Contract MDA903-81-C-0555; ARPA Order 4344)

(AD-A136128; CMR-DARPA-7) Avail: NTIS HC A03/MF A01 CSCL 11/6

Precipitation at 450 C was studied in melt-spun ribbons containing up to 15 wt.% Mn in solid solution in Al. The as-spun ribbons were microsegregation-free at compositions up to 5 wt.% Mn, but in more concentrated alloys a cellular micro-structure was present. Upon annealing, four precipitate phases are observed, some of them being found preferentially on cell boundaries and others within the cells. Al6Mn, G and the G phase can coexist for long times at 450 C, but the G phase appears to be slightly more stable. A less stable T phase was detected in Al-5 wt.% Mn foils following short annealing periods. The supersaturation of the Al matrix can persist for many hours in alloys containing up to 3 wt.% Mn, but is essentially gone after 1 hour in alloys with 5 wt.% Mn or more. GRA

N84-18386# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CHARACTERISTICS OF THE MECHANICAL PROPERTIES AND THE FRACTURES OF AN ALPHA BETA TITANIUM ALLOY

G. Zhiming 18 Nov. 1983 18 p Transl. into ENGLISH from Hankong Cailiao Yanjiusua (China), v. 1, no. 2, 5-8 Dec. 1981 p 8-14

(AD-A136144; FTD-ID(RS)T-1575-83) Avail: NTIS HC A02/MF A01 CSCL 11/6

The mechanical properties and the electron fractography of three types of annealed structures of a martensite type Alpha-Beta titanium alloys (Ti-6.5 Al-3.5 Mo-2 Zr-0.3 Si) were compared. These three types of structures were: the equiaxed microstructure (the volume fraction of the primary Alpha structure was around 50%), the mixed structure (a structure with alternatingly aligned nearly equiaxed Alpha grains and distorted lamellar Alpha structure), and the lamellar structure (the lamellar Alpha plus Beta Widmanstatten structure + the alpha grain boundary). it was discovered that, in the aspects of tensile, impact, fatigue, and room temperature tensile property after extended exposure to 500 deg C, the equiaxed structure is superior to the other two structures. However, in the aspects of stress rupture and creep strength, the mixed structure is superior to the other two structures. The mixed structure has better overall characteristics. The characteristic of the electron fractograph of the equiaxed structure and the mixed structure showed a dimple pattern. R.J.F.

N84-18387# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering.

A FUNDAMENTAL STUDY OF P/M PROCESSED ELEVATED TEMPERATURE ALUMINUM ALLOYS Annual Technical Report, 1 Oct. 1981 - 30 Sep. 1982

A. Lawley and M. J. Koczak Mar. 1983 25 p

(Grant AF-AFOSR-0010-82; AF Proj. 2306)

(AD-A136154; AFOSR-83-1144TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

Aluminum alloys exhibiting high strength and improved creep resistance at elevated temperatures offer the potential for lower weight and reduced cost in aerospace components. Powder processing, involving controlled atomization and hot consolidation, provides a means for fabricating candidate alloys; the microstructure consists of a stable fine-scale uniform dispersion of intermetallics in the aluminum marix. Retention of elevated temperature strength has been demonstrated in a P/M Al-Fe-Ni alloy. Atomized powder is characterized by a duplex microstructure of fine and coarse regions of FeNiAl9 (Vf approximately = 0.3) in the aluminum matrix. The fine microstructure is harder than the coarse microstructure and is stable up to approximately 350 C, above which its hardness decreases rapidly. There is a gradual coarsening and decrease in hardness of the initially coarse regions with increasing temperature. The duplex microstructure is carried over into the hot pressed and extruded material. Changes in microstructure and hardness of the extruded material during elevated temperature exposure are similar to those occurring in the powder form. Hot tensile test data (up to 400 C) indicate that the extruded material retains approximately 60% of its ambient strength up to approximately 250 C with ductility approaching 10%. This reflects a promising level of structural stability. These results and observations can be explained in terms of particle cooling rate, precipitation of aluminides, and aluminide coarsening during powder processing; powder consolidation temperatures should be kept as low as possible. Author (GRA)

N84-18388# Imperial Coll. of Science and Technology, London (England).

THE ROLE OF HYDROGEN IN THE STRESS CORROSION FAILURE OF HIGH STRENGTH Al-Zn-Mg ALLOYS Annual Technical Report

M. L. Yuen and H. M. Flower Oct. 1983 30 p

(Contract DAJA37-80-C-0372)

(AD-A136212) Avail: NTIS HC A03/MF A01 CSCL 11/6

Two alloys, Al 6% Zn 3% Mg 1.7% Cu and Al 6% Zn 3% Mg 0.14% Cr artificially aged at 120 C for times up to 400 hours have been tested at room temperature in tension in two aqueous environments, distilled water and 3.5% sodium chloride solution at strain rates of 10 tc the minus 4th power/second, 10 to the minus 5th power/second, and 10 to the minus 6th power/second. The results have been compared with previous data on fast and slow strain rate pre-exposure tests. Also conventional dead load tests were carried out in laboratory air and distilled water using the copper containing alloy. Both the slow strain rate technique and the dead load test are closely related and the observations are consistent with the hydrogen model for embrittlement via

reaction of the metal with the testing environment during straining or loading. The hydrogen adsorbed into the grain boundaries and the grain matrix causes grain boundary decohesion and cleavage. The ability to trap this hydrogen as innocuous hydrogen bubbles improves the embrittlement resistance. A peak embrittlement resistance is found to be around 150-250 hours of ageing at 120 C for the copper quaternary alloy. The embrittlement resistance mechanism and kinetics are not fully understood and may be complicated by the dissolution processes which accompany hydrogen generation. In this context the observation of grain boundary oxide films on the fracture surfaces of a small number of the dead load samples may be of importance. GRA

N84-18389# Pittsburgh Univ., Pa.
STUDIES OF SUPPORTED METAL CATALYSTS Final Report, 1 Sep. 1979 - 30 Apr. 1984
David M. Hercules Apr. 1984 13 p refs
(Contract DE-AC02-79ER-10485)
(DE84-004210; DOE/ER-10485/T4) Avail: NTIS HC A02/MF A01

A variety of surface spectroscopic techniques, coupled with chemical activity measurements, was used to study supported heterogeneous catalysts. The catalytic systems investigated are: Ni on Al2O3 and SiO2, Co on Al2O3, Co and Zn on Al2O3, Mo on Al2O3, Mo in TiO2, W on Al2O3, Co and Mo on Al2O3 and Ni and W on Al2O3. Defining the nature of the surface species on the oxidic catalysts, prior to treatment or activation is emphasized. Reaction of catalysts with H2 and H2S/H2 were used for diagnosing different species. Treatment with Ha2S/H2 was also used to elucidate the species on sulfided hydrotreating catalysts. Other aspects of the research involved evaluation of photoacoustic spectroscopy for studying catalysts and use of curve resolving techniques to maximize use of ESCA spectra for studying catalysts. The species on catalysts with loadings below monolayer coverage are determined by the nature of the support. Interaction species for ternary catalyst systems, viz. Co-Mo-Al2O3 are indicated. DOE

N84-18390# Michigan State Univ., East Lansing.
STUDIES ON AGE-HARDENING IN SPINODALLY MODULATED ALLOYS: EXPERIMENTAL AND THEORETICAL Progress Report, 1 May 1983 - 30 Apr. 1984
Dec. 1983 125 p refs
(Contract DE-AC02-81ER-10942)
(DE84-004650; DOE/ER-10942/3) Avail: NTIS HC A06/MF A01

Dislocations in deformed as quenched and aged Cu-10Ni-Sn alloy were analyzed. Burgers vector analysis indicated that deformation of as quenched specimens occurred predominantly by edge and screw dislocations, while mixed dislocations are mainly responsible for deformation of aged specimens. In situ straining of Cu-10Ni-6Sn in HVEM provided information on dislocation behavior in the modulated structure. Video recording was conducted on the dislocation shape during deformation, dislocation velocity and the mode of slip propagation. Fracture of this alloy seems to occur by void coalescence in front of the opening crack. Theoretical studies dealt with developing models for dislocation behavior in alloys that have undergone later stages of decomposition. The role of wave squaring of the internal stress field on critical resolved shear stress (CRSS) is analyzed. DOE

N84-18391# Argonne National Lab., Ill. Materials Science and Technology Div.
EVALUATION OF STAINLESS STEEL PIPE CRACKING: CAUSES AND FIXES
W. J. Shack, T. F. Kassner, P. S. Maiya, F. A. Nichols, J. Y. Park, W. Ruther, and E. F. Rybicki Oct. 1983 24 p refs Presented at the 11th NRC Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 24-28 Oct. 1983 Sponsored in part by the Nuclear Regulatory Commission
(Contract W-31-109-eng-38)
(DE84-003459; CONF-8310143-60) Avail: NTIS HC A02/MF A01

Leaks and cracks in the heat affected zones of weldments in austenitic stainless steel piping and associated components of boiling water reactors (BWRs) were observed. Remedies intended to produce a more favorable residual stress state, materials which are more resistant to stress corrosion cracking (SCC), and changes in the reactor environment which decrease the susceptibility to cracking are proposed. Key variables such as residual stresses, crack growth rates, and the leak before break margin in flawed piping in operating plants are outlined. The following phenomena were studied: (1) studies of impurity effects on susceptibility to intergranular stress corrosion cracking (IGSCC); (2) crack growth rate measurements; (3) finite element studies of residual stress produced by induction heating stress improvement (IHSI) and the addition of weld overlays to flawed piping; (4) leak before break analyses of piping with 3600 part through cracks; and (5) parametric studies on the effect through wall residual stresses on IGSCC crack growth behavior in large diameter piping weldments. DOE

N84-18392# Pacific Northwest Lab., Richland, Wash.
CORROSION BEHAVIOR OF Ni(+)-ION IRRADIATED NiTi ALLOYS
R. Wang and J. L. Brimhall Nov. 1983 14 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 13-18 Nov. 1983
(Contract DE-AC06-76RL-01830)
(DE84-003891; PNL-SA-11488; CONF-831174-38) Avail: NTIS HC A02/MF A01

Corrosion behavior of Ni( )-irradiated NiTi alloys was studied in chloride solutions, together with unirradiated NiTi material with different surface conditions. Ion irradiation with either 2.5 or 5 MeV Ni( ) ions transformed the NiTi surface into an amorphous layer up to 1.5 micrometers thick. The corrosion potential vs time and polarization behavior was studied and a small enhancement of the passivation for the Ni( )-irradiated NiTi over the unirradiated NiTi was indicated. The unirradiated NiTi with a mechanically polished, course surface is susceptible to pitting and crevice corrosion attack in 1 N HCl solution. The homogeneous amorphous structure in the irradiated alloy retards this type of localized corrosion. DOE

N84-18393# Argonne National Lab., Ill. Materials Science and Technology Div.
CORROSION AND OXIDATION OF VANADIUM-BASE ALLOYS
B. A. Loomis and G. Wiggins (Boston Univ.) Oct. 1983 6 p refs Presented at the 3rd Topical Meeting on Fusion Reactor Mater., Albuquerque, N. Mex., 19-22 Sep. 1983
(Contract W-31-109-eng-38)
(DE84-003266; CONF-830942-70) Avail: NTIS HC A02/MF A01

The corrosion of several V-base alloys on exposure at elevated temperatures to helium environments containing hydrogen and/or water vapor are presented. The consequences of the selection of certain radiation damage resistant and V-base alloys for structural materials applications in a fusion reactor are discussed. DOE

N84-18394# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
MECHANICAL PROPERTIES OF A MODIFIED 2 1/4 Cr-1 Mo STEEL FOR PRESSURE VESSEL APPLICATIONS
R. L. Klueh and R. W. Swindeman Dec. 1983 41 p refs
(Contract W-7405-eng-26)
(DE84-004105; ORNL-5995) Avail: NTIS HC A03/MF A01

Tensile and creep properties on a V-Ti-B-modified 2 1/4 Cr-1 Mo steel considered to be a candidate alloy for pressure vessel applications for coal liquefaction were determined. The modified 2 1/4 Cr-1 Mo steel had about 0.2% V added for improved elevated temperature strength and 0.02% Ti for grain refinement. Boron was added to improve the hardening, which allows thicker sections to be quenched and normalized to completely bainitic microstructures. Lower carbon and silicon concentrations were used (approx. 0.1% C and 0.02% Si) than in standard 2 1/4 Cr-1 Mo steel. The mechanical properties determined on the modified steel after a heat treatment typical for SA-387, grade 22, class 2, indicated high toughness and excellent elevated temperature tensile and creep strength. The modified steel had substantially better stress rupture properties than the standard 2 1/4 Cr-1 Mo steel with equivalent tensile properties (both with bainitic microstruc-

tures) especially at the lowest stresses and highest temperatures. The modified steel toughness properties are superior to those of the standard 2 1/4 Cr-1 Mo steel. Comparative transmission electron microscopy studies of the standard and modified 2 1/4 Cr-1 Mo steels indicate that the differences involve the carbide precipitates and the dislocation substructures present in the steels. DOE

N84-18395# Monsanto Research Corp., Miamisburg, Ohio.
ATOMIC ABSORPTION SPECTROPHOTOMETRIC METHODS FOR THE DETERMINATION OF PHOSPHOROUS AND SILICON IN STEEL
J. P. McCarthy, E. B. Nunn, and C. Kinard 1983 7 p refs Presented at the 26th ORNL-DOE Conf. on Anal. Chem. in Energy Technol., Knoxville, Tenn., 11 Oct. 1983
(Contract DE-AC04-76DP-00053)
(DE84-002826; MLM-3115(OP); CONF-831025-28) Avail: NTIS HC A02/MF A01

Several methods to determine phosphorus in steel by graphite furnace atomic absorption spectrophotometry (GFAA) are presented. The methods evaluated are those involving zirconium carbide furnace tubes, chemical matrix modification with La, the use of the method of additions and calibration via NBS standards. Flame AA (FAA) methods for Si determination is reviewed. An overall procedure is described which allows the GFAA determination of phosphorus, with matrix modification using lanthanum and FAA determination of silicon and metal constituents in steel from a single sample dissolution using NBS steels as calibration standards. DOE

N84-18396# Bend Research, Inc., Oreg.
COUPLED-TRANSPORT MEMBRANES FOR METAL SEPARATIONS, PHASE 5 Report, 24 Sep. 1981 - 24 Jul. 1983
W. C. Babcock, M. B. Chidlaw, D. J. Kelly, and E. D. LaChapelle Aug. 1983 53 p refs
(PB84-127034; BU-BUMINES-OFR-203-83) Avail: NTIS HC A04/MF A01 CSCL 11F

A liquid membrane process called coupled transport is applied to the recovery of metals from hydro-metallurgical leach solutions. During this phase, a membrane system of moderate scale was constructed and field-tested. The test unit contained four hollow-fiber membrane modules, each with 100 sq. ft. 2 of membrane area. In the field tests, about 1,000 gallons per day of leach solution was processed. The unit was operated on the leach solution for about 50 days. Leach solution entering the unit contained 100 ppm uranium. This concentration was reduced to about 5 ppm by coupled- transport treatment, and the uranium was concentrated to about 2 wt% as a uranyl carbonate product. Under these conditions, a transmembrane uranium flux of about 2.5. lb/sq. ft. 2 per year was obtained. GRA

N84-18444# Aluminium Extrusion Co. (Proprietary) Ltd., Elandsfontein (South Africa).
ALUMINIUM EXTRUSION: A METAL FORMING PROCESS
C. E. Ulyate *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 8 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

N84-18446# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Metallurgy.
METAL FORMABILITY IN BULK DEFORMATION PROCESSES
E. Ulvan and A. Doursaris *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 29 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

N84-18447# Huletts Aluminium Ltd., Pietermaritzburg (South Africa).
THE MANUFACTURE AND FINISHING OF ALUMINIUM EXTRUSION DIES
I. H. Rowsell *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 13 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-18397 Royal Armament Research and Development Establishment, Fort Halstead (England). Explosives, Pyrotechnics and Materials Dept.
THE BASIC PLY PROPERTIES OF A KEVLAR 49/EPOXY RESIN COMPOSITE SYSTEM
M. L. C. Jones Nov. 1983 38 p refs
(AD-A136614; RARDE-11/83; BR89939) Copyright. Avail: Issuing Activity

The stress/strain behavior of a unidirectional Kevlar/epoxy resin composite system under each of five uniaxial stress states was determined. The responses of the unreinforced epoxy resin to three uniaxial stress states were also determined. The excellent longitudinal tensile properties, combined with the low density of this composite system allow the design of structures which are significantly more weight efficient than similar structures made from an E glass/epoxy system. However, the relatively poor compressive and transverse tensile properties make Kevlar/epoxy composites unsuitable for applications where significant compressive or bending loads are expected. Author (ESA)

N84-18398*# National Aeronautics and Space Administration, Washington, D. C.
CHARACTERIZATION OF CERAMIC POWDERS BY AN X-RAY MEASURING METHOD
B. Ziegler Jul. 1983 15 p refs Transl. into ENGLISH from Keram. Z. (West Germany), v. 33, no. 5, 1981 p 287-290 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77094; NAS 1.15:77094) Avail: NTIS HC A02/MF A01 CSCL 11B

X-ray line broadening analysis gives quantitative data on structural changes of ceramic powders after different processing steps. Various Al2O3 powders were investigated and the following points are discussed on the basis of these results: X-ray line broadening analysis, structural changes during grinding, structural changes during annealing, influence of structural properties on sintering behavior and application of line broadening analysis to quality control of powders. Author

N84-18399*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WATER-VAPOR EFFECTS ON FRICTION OF MAGNETIC TAPE IN CONTACT WITH NICKEL-ZINC FERRITE
Kazuhisa Miyoshi and Donald H. Buckley Feb. 1984 10 p refs
(NASA-TP-2279; E-1768; NAS 1.60:2279) Avail: NTIS HC A02/MF A01 CSCL 11G

The effects of humidity of moist nitrogen on the friction and deformation behavior of magnetic tape in contact with a nickel-zinc ferrite spherical pin were studied. The results indicate that the coefficient of friction is markedly dependent on the ambient relative humidity. Although the coefficient of friction remains low below 40-percent relative humidity, it increases rapidly with increasing relative humidity above 40 percent. The general ambient environment of the tape does not have any effect on the friction behavior if the area where the tape is in sliding contact with the ferrite pin is flooded with controlled nitrogen. The response time for the friction of the tape to humidity changes is about 10 sec. The effect of friction as a function of relative humidity on dehumidifying is very similar to that on humidifying. A surface softening of the tape due to water vapor increases the friction of the tape. Author

N84-18400*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BEAM IMPINGEMENT ANGLE EFFECTS ON SECONDARY ELECTRON EMISSION CHARACTERISTICS OF TEXTURED PYROLYTIC GRAPHITE
Arthur N. Curren and Kenneth A. Jensen Feb. 1984 16 p refs (NASA-TP-2285; E-1886; NAS 1.60:2285) Avail: NTIS HC A02/MF A01 CSCL 11G

Experimentally determined values of true secondary electron emission and relative values of reflected primary electron yield for untreated and ion-textured pyrolytic graphite over a range of primary electron energy levels and electron beam impingement angles are presented. Information required to develop high efficiency multistage depressed collectors (MDC's) for microwave amplifier traveling-wave tubes for space communication and aircraft applications is provided. To attain the highest possible MDC efficiencies, the electrode surfaces must have low secondary electron emission characteristics. Pyrolytic graphite, a chemically vapor-deposited material, is a particularly promising candidate for this application. The pyrolytic graphite surfaces studied were tested over a range of primary electron beam energies and beam impingement angles from 200 to 2000 eV and direct (0 deg) to near-grazing angles (85 deg), respectively. Surfaces both parallel to and normal to the planes of material deposition were examined. The true secondary electron emission and reflected primary electron yield characteristics of the pyrolytic graphite surfaces are compared to those of sooted control surfaces. S.L.

N84-18401*# California Inst. of Tech., Pasadena. Seismological Lab.
SHOCK TEMPERATURES IN ANORTHITE GLASS
Mark B. Boslough, Thomas J. Ahrens, and Arthur C. Mitchell (California Univ., Livermore. Lawrence Livermore Lab.) [1983] 33 p refs
(Grants NGL-05-002-105; NSF EAR-78-12942)
(NASA-CR-173364; NAS 1.26:173364) Avail: NTIS HC A03/MF A01 CSCL 11B

Temperatures of $CaAl_2Si_2O_8$ (anorthite glass) shocked to pressures between 48 and 117 GPa were measured in the range from 2500 to 5600 K, using optical pyrometry techniques. The pressure dependence of the shock temperatures deviates significantly from predictions based on a single high pressure phase. At least three phase transitions, at pressures of about 55, 85, and 100 GPa and with transition energies of about 0.5 MJ/kg each (approximately 1.5 MJ/kg total) are required to explain the shock temperature data. The phase transition at 100 GPa can possibly be identified with the stishovite melting transition. Theoretical models of the time dependence of the thermal radiation from the shocked anorthite based on the geometry of the experiment and the absorptive properties of the shocked material yields good agreement with observations, indicating that it is not necessary to invoke intrinsic time dependences to explain the data in many cases. S.L.

N84-18402# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF A CORROSION CONTROL, NONEMISSIVE PAINT FOR THE PROTECTION OF BILGE SPACES Final Report, 28 Sep. 1981 - 27 Sep. 1982
D. E. Wirth, R. L. Bell, J. P. Pfau, and R. J. Dick 27 Sep. 1982 51 p
(Contracts N00167-81-C-0248; N00167-81-C-0047)
(AD-A136270) Avail: NTIS HC A04/MF A01 CSCL 11/3

A research program has been conducted to develop a corrosion control nonemissive paint for the protection of bilges. This report covers Year Two of a multiyear development program. Laboratory studies have been concerned with developing bilge paints based on water-dilutable resins (polyvinylidene chloride, neoprene, acrylic, and polyurethane latices), 100% solids epoxy resins, and cementitous resins. Several preliminary formulations based on epoxy and cementitious resins have been identified as bilge paint candidates. The effects of poor surface preparation as encountered on a submarine under way, particularly on paint adhesion, have also been studied. It appears that epoxy-resin based paints may be sufficiently forgiving to accept these limitations without compromising performance. Long-term paint adhesion has yet to be determined. Author (GRA)

N84-18403# Missouri Univ., Rolla.
RELIABILITY STUDIES OF CERAMIC CAPACITORS Progress Report, 1 Jul. 1982 - 30 Jun. 1983
H. U. Anderson and D. E. Day Jul. 1983 69 p
(Contract N00014-82-K-0294)
(AD-A136378) Avail: NTIS HC A04/MF A01 CSCL 09/1

This research goal is to determine the parameters that lead to intrinsic and extrinsic failure of ceramic capacitors. To achieve this goal, electrical measurements and microstructural evaluations on both commercial and laboratory prepared specimens with the following test methods were made: destructive microstructural evaluation, I-V measurements in both low voltage and degradation field regions, and thermally stimulated polarization and depolarization current measurements. GRA

N84-18404# SRI International Corp., Menlo Park, Calif. Materials Research Lab.
SILICON NITRIDE JOINING Annual Report, 31 Jan. 1982 - 31 Jan. 1983
Sylvia M. Johnson and David J. Rowcliffe 31 Mar. 1983 44 p
(Contract F49620-81-K-0001; AF Proj. 2306; SRI Proj. PYU-2527)
(AD-A136547; AFOSR-83-1145TR) Avail: NTIS HC A03/MF A01 CSCL 11/2

Silicon nitride can be joined using an oxide glass which reacts to form a phase similar to the grain boundary phase found in hot pressed Si_3N_4. The microstructure and interfacial reactions were studied by scanning transmission electron microscopy and X-ray diffraction. Silicon nitride dissolves in the glass and silicon oxynitride crystals precipitate. The glass also penetrates the Si_3N_4 and is present as enlarged glass pockets in the bulk ceramic away from the joint. The optimal joining conditions were determined to be 1575 to 1650 C and 30 to 60 minutes. The maximum strengths at room temperature determined by 4 point bend tests of bars joined under these conditions were approximately 460 MPa, regardless of the specific conditions. The strength is related to the joint thickness, reaching a maximum for joint thicknesses of approximately 25 to 35 micrometers. Two fracture mechanisms were identified by SEM. Silicon oxynitride crystals grow across thin joints and the resulting microstructure is strong if few pores are present. Thermal expansion mismatch cracks are present in thicker joints and there are multiple fracture origins. Preliminary attempts to heat treat joints to promote crystallization resulted in vaporization of the glass and a low strength. GRA

N84-18405# Cambridge Univ. (England).
LIQUID IMPACT EROSION MECHANISMS IN TRANSPARENT MATERIALS Final Report, 30 Sep. 1980 - 31 Mar. 1983
J. E. Field, S. vanderZwaag, D. Townsend, and J. P. Dear Wright-Patterson AFB, Ohio AFWAL Oct. 1983 82 p
(Grant AF-AFOSR-3705-78; AF Proj. 2422)
(AD-A135891; AFWAL-TR-83-4101) Avail: NTIS HC A05/MF A01 CSCL 17/5

This project has been concerned with developing techniques for the study of liquid impact, with studying the behavior of various infra-red transparent solids with analytic work on hard coatings and with basic studies of liquid/solid impact. Damage has been assessed quantitatively by measuring the 'residual' strength after impact and plotting strength against velocity of substrates with a hard coating. The protection offered by the coating is examined in terms of the elastic properties of the coating and its thickness. Section 2 reviews our recent liquid impact damage studies. Section 3 describes a study of the effect of thin coatings on the damage to brittle materials due to static and dynamic loading. Section 4 describes our basic work on liquid/solid impact in which techniques were developed for producing impacts of a solid with two dimensional liquid shapes. This geometry allowed processes occurring inside the liquid to be followed in detail using high-speed photography. This section also contains an analytic model for the early stage of jet formation. GRA

N84-18406# Akron Univ., Ohio. Inst. of Polymer Science.
EFFECT OF AMINE SURFACE TREATMENT ON THE ADHESION OF A POLYURETHANE TO THE SURFACE
F. Liang and P. Dreyfuss Dec. 1983 28 p
(Contract N00014-76-C-0408)
(AD-A135591; TR-29) Avail: NTIS HC A03/MF A01 CSCL 11/1

Amines in general and 3-aminopropyltriethoxysilane in particular were shown to improve the adhesion of a polyurethane to glass. At equivalent concentrations of amine in the solutions used to treat the glass the order of increase in the work of adhesion was 3-aminopropyltriethoxysilane >> 1,4-diaminobutane approximately p-phenylendiamine > piperazine >> aniline. The polyurethane was prepared from ARCO's hydroxyterminated polybutadiene, R-45HT, toluene diisocyanate, trimethylolpropane and N,N-bis(2-hydroxypropyl) aniline. The ratio ((-NCO)/(total OH)) was kept constant and equal to 1.0. The swelling ratio, after curing, also remained constant. As the -NCO content compared to polymer-OH increased, the adhesion of the polyurethane to glass increased initially, passed through a maximum for prepolymers with 6% excess NCO, and then decreased again. Elongation at break behaved similarly but ultimate tensile strength reached a maximum and then stayed constant. The significance of these results is discussed. Adhesion of the polyurethane to chrome-plated steel did not show similar effects. GRA

N84-18407# Pennsylvania State Univ., University Park. Dept. of Chemistry.
CYCLIC AND HIGH POLYMERIC PHOSPHAZENES AS CARRIER MOLECULES FOR CARBORANYL, METALLO, OR BIOACTIVE SIDE GROUPS Interim Technical Report
H. R. Allcock 5 Dec. 1983 25 p
(Contract N00014-75-C-0685)
(AD-A135656; TR-30) Avail: NTIS HC A02/MF A01 CSCL 07/3

Cyclic and high polymeric phosphazenes can be modified by nucleophilictype substitution reactions to generate a wide range of derivatives. Recent developments include the introduction of bioactive organic residues to yield biologically active high polymers and the synthesis of transition metal derivatives of phosphazenes. In addition, hybrid phosphazenecarborane compounds have been prepared including examples in which nidocarboranyl units, attached to a phosphazene ring of chain, function as binding sites for transition metal organometallic units. GRA

N84-18408# Texas Univ., Austin. Dept. of Chemistry.
STUDIES OF POLYMER-BOUND MACROCYCLIC POLYTERTIARY PHOSPHINES Final Report, 1 Feb. 1979 - 31 Jul. 1983
Evan P. Ryba 31 Jul. 1983 12 p
(Grant AF-AFOSR-0090-79; AF Proj. 2303)
(AD-A135718; AFOSR-83-1074TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

The research objectives of this work were to synthesize functionalized macrocyclic polyphosphines (MPP) and to use the functional group to attach the MPP to a functionalized polymer support (PS). The PS-MPP species were to be studies for their ability to coordinate transition metals, and to compare the behavior of PS-MPP-metal complexes with that of non-PS-MPP analogs. GRA

N84-18409# Hercules, Inc., Magna, Utah.
SYNTHESIS OF ENERGETIC PREPOLYMERS Final Report, 1 Sep. 1982 - 30 Sep. 1983
Robert A. Earl, R. Douglas Carpenter, and Michael G. Mangum Nov. 1983 65 p
(Contract N00014-82-C-0431)
(AD-A135770) Avail: NTIS HC A04/MF A01 CSCL 07/4

A new route to the synthesis of nitrooxetanes was explored. The final ring-closure step to yield 3-methyl-3-nitrooxetane has not yet been carried out successfully. Precursors to the synthesis of 3,3-dinitro-oxetane have been prepared. 3-Azidomethyl-3-methyloxetane has been prepared by a new synthetic route that should be useful in the event of a scale-up. Polymers derived from 3-(2,3-diazidopropoxymethyl)-3-methyl oxetane and 2-azidomethyl-3-(2,3-diazidopropoxy-methyl)-3-methyl oxetane and 3-azidomethyl-3-(2,3-diazidopropoxymethyl)oxetane have been prepared and appear to have good low temperature and stability properties. Author (GRA)

N84-18410# Monsanto Research Corp., Dayton, Ohio.
TURBINE ENGINE LUBRICANT RECLAMATION Final Report, 1 Sep. 1979 - 1 Mar. 1983
Richard J. Bruns and George L. Beemsterboer Wright-Patterson AFB, Ohio AFWAL Jun. 1983 265 p
(Contract F33615-79-C-2052; AF Proj. 3048)
(AD-A135926; MRC-DA-1120; AFWAL-TR-83-2042) Avail: NTIS HC A12/MF A01 CSCL 11/8

A distillation and adsorption treatment for reclaiming used MIL-L-7808 turbine oils was investigated. A viable additive package was tested on different MIL-L-7808 type virgin base stocks. Fifteen used oils were analyzed by acid number, high performance liquid chromatography, and gas chromatography. A distillation process utilizing caustic (sodium hydroxide) pretreatment was developed on 500-mL and 13-liter scales. Adsorption treatment of distilled oils consisted of barium hydroxide monohydrate. A total of ten 15-25 gallon batches of oil were reclaimed/reformulated and MIL-L-7808H tested. Test results were generally good. However, none of the 10 batches completely passed all of the tests. An extensive screening procedure was found necessary to identify contaminated used oil samples. An engineering cost study is included. GRA

N84-18411*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
VISCOELASTIC ANALYSIS OF ADHESIVE STRESSES IN BONDED JOINTS Final Report
L. R. Botha, R. M. Jones, and H. F. Brinson May 1983 166 p
(Grant NAG1-227; Contract N00014-82-K-0185)
(NASA-CR-173243; NAS 1.26:173243; AD-A135963; VPI-E-83-17) Avail: NTIS HC A08/MF A01 CSCL 11A

Existing closed form solutions for the stress analysis of the single lap joint were studied intensively, and methods of analysis and assumptions between the analyses of Goland and Reissner, Hart-Smith and Delale and Erdogan were compared. The existing SAAS3V finite element program was modified to accommodate additional mesh generation and plotting capabilities. The modified version, SSAAS3VP, was used for performing linear elastic and viscoelastic analyses on the single lap joint, and a non-linear viscoelastic analysis on the thick adherend specimen. Metlbond 1113 and Araldite adhesive properties were used in the linear elastic and viscoelastic analyses, respectively. FM-73 adhesive properties were used in the non-linear viscoelastic analysis. Time-dependent shear moduli were calculated from the results of the latter analysis and compared with the experimentally obtained shear modulus of Krieger. Interface layers were defined in both the single lap and thick adherend analyses and the influence of changing the interface layer stiffness on adhesive stresses was also investigated. GRA

N84-18412# Martin Marietta Corp., Baltimore, Md.
ENVIRONMENTAL DURABILITY OF ALUMINUM ADHESIVE JOINTS PROTECTED WITH HYDRATION INHIBITORS Third Year Report, 1 Jul. 1982 - 30 Jun. 1983
G. D. Davis, J. S. Ahearn, and J. D. Venables Nov. 1983 69 p
(Contract N00014-80-C-0718)
(AD-A135304; MML-TR-83-34C) Avail: NTIS HC A04/MF A01 CSCL 11/1

The adsorption of selected, organic, hydration inhibitors onto and the subsequent hydration of Forest Products Laboratory (FPL)-etched surfaces has been studied using X-ray photoelectron spectroscopy (XPS) and surface behavior diagrams (SBD's) supplemented by inelastic electron tunneling spectroscopy (IETS) and Fourier Transform Infrared Spectroscopy (FTIR). The results indicate that nitrilotris methylene phosphonic acid (NTMP) and related compounds adsorb to the alumina surface via the POH bonds of the phosphonic acid groups, resulting in a displacement

of water normally adsorbed onto the surface. A model of adsorption was developed that suggests that at very low treatment solution concentrations (approx 1 ppm) only one leg of the NTMP molecule adsorbs onto the surface although at higher concentrations (approx 100 ppm) all three legs do. Hydration is a three-step process: (1) a reversible physisorption of water, (2) a slow dissolution of the inhibitor followed by a rapid hydration of the freshly exposed Al2O3 to boehmite AlOOH, and (3) a further hydration of the AlOOH to bayerite Al(OH)3. It is during the second step that bond failure occurs with the dissolution of the inhibitor being the rate limiting reaction. Analysis of the adsorption, hydration, and wedge tests results using different inhibitors suggests four criteria of an inhibitor to promote good bond performance: occupation of all active sites on the Al2O3 surface, strong inhibitor surface bonds, insolubility of the resulting inhibitor-aluminum complex in aqueous solutions, and compatibility with the adhesive/primer. GRA

N84-18413# Oak Ridge National Lab., Tenn.
STATUS, NEEDS, AND OPPORTUNITIES FOR STRUCTURAL CERAMICS IN ADVANCED HEAT ENGINES
V. J. Tennery 1983 12 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14 Nov. 1983
(Contract W-7405-eng-26)
(DE84-003307; CONF-831174-43) Avail: NTIS HC A02/MF A01

The potential for using structural ceramic materials in components of advanced heat engines including the gas turbine and adiabatic diesel has recently been demonstrated by results in DOE and DOD engine development programs. Status of these efforts, technical needs for candidate ceramic materials, and research opportunities in new DOE and NASA ceramic technology programs oriented to heat engines are reviewed. DOE

N84-18414# Cornell Univ., Ithaca, N.Y.
MIGRATION OF GRAIN BOUNDARIES IN CERAMIC MATERIALS WITH PARTICULAR REFERENCE TO THE SINTERING PROCESS Technical Progress Report for the second year, 15 Jan. - 14 Dec. 1983
C. B. Carter 14 Dec. 1983 9 p refs
(Contract DE-AC02-82ER-12076)
(DE84-004086; DOE/ER-12076/T1) Avail: NTIS HC A02/MF A01

The effect of geometry and composition of interfaces in ionic and convalent materials on the ability of such interfaces to migrate was investigated. Faceted interfaces in Al2O3 and Mg-Al spinel; the morphology of Al2O3 polycrystalline compacts and the relation to grain boundaries in Al2O3; and the structure, dissociation and migration of grain boundaries in Si and Ge are studied. DOE

N84-18415# Sandia Labs., Albuquerque, N. Mex. Geomechanics Div.
DYNAMIC FRAGMENTATION OF FERROELECTRIC CERAMICS USING THE TORSIONAL KOLSKY BAR
Laurence S. Costin and Dennis E. Grady Oct. 1983 33 p refs
(Contract DE-AC04-76DP-00789)
(DE84-003726; SAND-83-2004) Avail: NTIS HC A03/MF A01

The dynamic loading and subsequent fragmentation of four different load zirconate titanate (95/5 PZT) ferroelectric ceramics were studied. The strain gage of the incident was recorded and reflected and transmitted pulses, the energy required to fragment the specimen was determined for each test. Differences in particle distributions between the different batches of materials are shown. The difference between the dynamic strength and the fragment mass distributions of the virgin material and the pressure depoled material, despite the fact that no differences were detected in the energy of fragmentation is shown. A relationship between the distribution of fragments from a test and material properties was derived. Results of tests on PZT and other materials such as oil shale, graphite, uranium dioxide and glass indicate a good correlation between the fragment distribution parameter, n, and material properties as predicted by the theory. The potential effects of internal stresses on the dynamic strength of the material and its fragmentation characteristics are determined. DOE

N84-18416# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Structures Dept.
INTEGRITY CONTROL OF CARBON FIBER REINFORCED PLASTICS STRUCTURAL ELEMENTS, PHASE 1 REPORT
W. H. Paul and D. Wagner Paris ESA 8 Apr. 1983 342 p refs
(Contract ESA-4442/80/NL-AK(SC))
(TB-TS-11-01/82-A; ESA-CR(P)-1778) Avail: NTIS HC A15/MF A01

An integrity control program for CFRP structural elements, to avoid catastrophic failures due to propagation of defects and imperfections inherent in FRPs is established. Based upon the experience with fracture control of elements made from homogeneous materials, the control logic applicable to safety relevant elements is determined and consequences in application through all project phases are considered. Problems in defining adequate acceptance/rejection criteria for quality assurance are identified, given the difficulties in determination of local inter and intra laminary stresses at notches and defects. The phenomenological approach to relate damage propagation under operational conditions to initial gross stresses cannot describe the real process: cracking, especially delamination, results in a significant change of stresses in individual layers. A tranfer matrix analytical method is proposed. Author (ESA)

N84-18417# Brown Univ., Providence, R. I.
BASIC RESEARCH ON MACROMOLECULAR DYNAMICS Annual Report, 1 Jun. 1982 - 31 May 1983
J. H. Weirner Aug. 1983 12 p refs Sponsored by Gas Research Inst.
(PB84-123538; GRI-82/0088) Avail: NTIS HC A02/MF A01 CSCL 11I

The widespread use of plastic pipe for gas distribution dictates the need for obtaining as thorough an understanding of the mechanical behavior of plastics as possible in order to maximize safety and economy. This behavior is studied on various levels: (1) the macroscopic scale, in which the plastic is regarded as a homogeneous continuum, (2) the microscopic scale, in which crystalline and non-crystalline regions are distinguished, and (3) the atomic scale, treating individual long-chain molecules. Studies on the various levels are mutually complementary. This program deals with the atomic level. Computer simulation of the thermomechanical behavior of long-chain molecules by the method of Brownian dynamics is being developed. GRA

N84-18468# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).
MOISTURE RESISTANT MoS2-BASED COMPOSITE LUBRICANT FILMS
P. Niederhaeuser, M. Maillat, and H. E. Hintermann *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 119-123 refs Sponsored by Kommission zur Foerderung der Wissenschaftlichen Forschung (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-18418*# Oak Ridge National Lab., Tenn. Chemistry Div.
ELECTRON SPIN RESONANCE STUDY OF THERMAL INSTABILITY REACTIONS IN JET FUELS Annual Report
Henry Zeldes and Ralph Livingston Jan. 1984 51 p refs
(Contract W-7405-eng-26)
(NASA-CR-168333; NAS 1.26:168333) Avail: NTIS HC A04/MF A01 CSCL 21D

Free radicals were studied by electron spin resonance (ESR)

using model compounds that are representative of constituents of jet fuels. Radical formation was initiated with peroxides and hydroperoxides by using UV photolysis at and near room temperature and thermal initiation at higher temperatures. Both oxygen free and air saturated systems were studied. N-Dodecane was frequently used as a solvent, and a mixture of n-dodecyl radicals was made with a peroxide initiator in n-dodecane (free of oxygen) thermally at 212 C and photolytically at room temperature. Hydrogen abstraction from the 3,4,5 and 6-positions gives radicals that are sufficiently alike that their spectra are essentially superimposed. The radical formed by abstract of hydrogen from the 2-position gives a different spectrum. ESR parameters for these radicals were measured. The radical formed by abstraction of a primary hydrogen was not observed. Similar radicals are formed from n-decane. A variety of exploratory experiments were carried out with systems that give free radical spectra to which was added small amounts of 2,5-dimethylpyrrole. Author

N84-18419*# Midwest Research Inst., Kansas City, Mo. Center for Safety and Engineering Analysis.
EXPERIMENTAL RESULTS FOR THE RAPID DETERMINATION OF THE FREEZING POINT OF FUELS Final Report
B. Mathiprakasam 9 Feb. 1984 62 p refs
(Contract AS3-22543)
(NASA-CR-168305; NAS 1.26:168305; MRI-7014-2) Avail: NTIS HC A04/MF A01 CSCL 21D

Two methods for the rapid determination of the freezing point of fuels were investigated: an optical method, which detected the change in light transmission from the disappearance of solid particles in the melted fuel; and a differential thermal analysis (DTA) method, which sensed the latent heat of fusion. A laboratory apparatus was fabricated to test the two methods. Cooling was done by thermoelectric modules using an ice-water bath as a heat sink. The DTA method was later modified to elirninate the reference fuel. The data from the sample were digitized and a point of inflection, which corresponds to the ASTM D-2386 freezing point (final melting point), was identified from the derivative. The apparatus was modifiied to cool the fuel to -60 C and controls were added for maintaining constant cooling rate, rewarming rate, and hold time at minimum temperature. A parametric series of tests were run for twelve fuels with freezing points from -10 C to -50 C, varying cooling rate, rewarming rate, and hold time. Based on the results, an optimum test procedure was established. The results showed good agreement with ASTM D-2386 freezing point and differential scanning calorimetry results. M.G.

N84-18420*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Electrical Engineering and Applied Physics.
APPLICATIONS OF PHOTOACOUSTIC TECHNIQUES TO THE STUDY OF JET FUEL RESIDUE Final Report, 22 Oct. 1980 - 20 May 1983
Paul C. Claspy 14 Nov. 1983 25 p refs
(Grant NAG3-98)
(NASA-CR-173322; NAS 1.26:173322) Avail: NTIS HC A02/MF A01 CSCL 21D

It has been known for many years that fuels for jet aircraft engines demonstrate thermal instability. One manifestation of this thermal instability is the formation of deleterious fuel-derived thermally-induced deposits on surfaces of the aircraft's fuel-handling system. The results of an investigation of the feasibility of applying photoacoustic techniques to the study of the physical properties of these thermal deposits are presented. Both phase imaging and magnitude imaging and spectroscopy were investigated. It is concluded that the use of photoacoustic techniques in the study of films of the type encountered in this investigation is not practical. S.L.

N84-18421# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
THE RELATIONSHIP BETWEEN ELECTRICAL CONDUCTIVITY AND TEMPERATURE OF AVIATION TURBINE FUELS CONTAINING STATIC DISSIPATOR ADDITIVES
L. Gardner and F. G. Moon Oct. 1983 46 p
(AD-A135751; DME-DM-1; NRC-22648) Avail: NTIS HC A03/MF A01 CSCL 20/4

The relationship between the electrical conductivity and temperature of Canadian produced wide-cut and kerosine type aviation turbine fuels containing static dissipator additives has been evaluated. Results obtained show that the temperature/conductivity coefficient, n, in the relationship log k subscript = n(t-t subscript 1) + log kt subscript 1 is dependent upon several factors including: (1) temperature range, (2) fuel type, and (3) additive type. It is recommended that the results of the evaluation be summarized and presented in the form of a test procedure which can be reference in aviation fuel specifications. Author (GRA)

N84-18422# Monsanto Research Corp., Miamisburg, Ohio.
ENERGETIC MATERIALS SEPARATIONS AND SPECIFIC POLYMORPH PREPARATIONS VIA THERMAL GRADIENT SUBLIMATION
David W. Firsich 1983 6 p refs Presented at the Joint Symp. on Compatibility of Plastics/Mater. with Explosives, Propellents and Pyrotechnics, Lake Ozark, Mo., 31 Oct. 1983
(Contract DE-AC04-76DP-00053)
(DE84-002830; MLM-3109-OP; CONF-8310159-5) Avail: NTIS HC A02/MF A01

The principles and methods of thermal gradient sublimation are presented, and experiments showing the application of the technique to energetic materials research are described. Results include the separation of TATB from chlorinated derivatives, the purification of HNAB, and the growth of specific polymorphic forms of HMX and HNAB. DOE

N84-18423# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
FRICTIONAL HOT-SPOTS AND STATISTICAL CRACK MECHANICS
John K. Dienes 1983 10 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 13-18 Nov. 1983
(Contract W-7405-eng-36)
(DE84-003784; LA-UR-83-3278; CONF-831174-42) Avail: NTIS HC A02/MF A01

Detonations which are often observed are discussed when propellant cylinders are fired at low speeds against a steel plate. The process is not repeatable, and shock heating is not significant; the possibility of detonation caused by hot spots is considered. Several mechanisms are compared, and it is suggested that interfacial friction of closed cracks seems to be the most likely mechanism. DOE

N84-18424# California Univ., Livermore. Lawrence Livermore Lab.
EQUATIONS OF STATE OF PBX-9404, LX-07, AND RX-26-AF DETONATION PRODUCTS AT PRESSURES ABOVE DETONATION PRESSURE
L. Green, E. Lee, A. Mitchell, R. Tipton, M. VanThiel, and M. Finger 14 Oct. 1983 13 p refs Presented at the Nucl. Explosives Design Conf., Los Alamos, N. Mex., 17-21 Oct. 1983
(Contract W-7405-eng-48)
(DE84-002465; UCRL-89664; CONF-8310173-2) Avail: NTIS HC A02/MF A01

Overdriven detonation experiments on LX-07-2, PBX-9404, and RX-26-AF which show the need to modify the currently used JWL EOS when pressures above C-J are encountered in the detonation products are discussed. It appears that the overdriven detonation results on PBX-9404 can be used to approximate the overdriven state in other high HMX PBX's. It is shown that the Chapman/Jouquet theory itself must be modified. DOE

N84-18425# Los Alamos Scientific Lab., N. Mex.
FUNDAMENTAL RESEARCH ON EXPLOSIVES
William C. Davis and T. Rivera 1983 6 p refs Presented at the Los Alamos/CEA High Explosives and Detonation Phys. Conf., Paris, 3-6 Oct. 1983
(Contract W-7405-eng-36)
(DE84-001201; LA-UR-83-2645; CONF-8310148-10) Avail: NTIS

HC A02/MF A01

The nitric oxide molecule was studied to understand the energetics and chemistry of initiation and detonation in liquid NO at the molecular level. An overview of the work is presented. DOE

N84-18426# Southwest Research Inst., San Antonio, Tex.
HEAVY-DUTY DIESEL EMISSIONS AS A FUNCTION OF ALTERNATE FUELS Final Report, 21 Nov. 1981 - 30 Jun. 1982
Terry L. Ullman and Charles T. Hare Sep. 1983 165 p refs
(Contract EPA-69-03-2884; SwRI Proj. 11-5830-014)
(PB84-120716; EPA-460/3-83-004) Avail: NTIS HC A08/MF A01 CSCL 21D

Exhaust emissions from a Mack EM6-300 heavy-duty diesel engine were characterized with five different fuels during transient and steady-state operation. A control fuel (Phillips D-2) was used for baseline emissions, and as a base stock in three alternate fuel blends containing EDS or SRC-II middle distillates or used lubricating oil. The fifth fuel tested was neat soybean oil, heated to 145 degrees. Emission measurements included HC, CO, CO2, NOx, visible smoke, particulate, IHC, aldehydes, odor (DOAS), phenols, sulfate, elemental composition, particle sizing, SOF, SOF boiling point distribution, BaP, Ames bioassay and HPLC fractionation. GRA

N84-18427# National Academy of Sciences - National Research Council, Washington, D. C. Board on Science and Technology for International Development.
PRODUCER GAS: ANOTHER FUEL FOR MOTOR TRANSPORT Final Report
Nov. 1983 111 p refs
(Contract AID/ta-C-1433; Grant AID-DAN-5538-G-SS-1023-00)
(PB84-129774; LC-81-834-15) Avail: NTIS HC A06/MF A01 CSCL 21D

Producer gas was introduced to researchers, agencies, and institutions engaged in assisting developing countries. The panel demonstrates to decision makers, administrators, and scientists that producer gas technology is worth investigating and hopes to encourage increased testing and use of producer gas as an automotive fuel. Producer gas represents an alternative to petroleum for fueling motor transport. It also has important, potential uses to fuel pumps, driers, and electric generators. Used during the fuel shortages of World War II, producer gas is generated from solid fuels such as wood, charcoal, coal, peat, and agricultural residues. Producer gas is made when a thin stream of air passes through a bed of glowing coals. GRA

N84-18428# National Academy of Sciences - National Research Council, Washington, D. C. Board on Science and Technology for International Development.
ALCOHOL FUELS: OPTIONS FOR DEVELOPING COUNTRIES Final Report
1983 120 p refs
(Contract AID/c-1433; Grant AID-DAN-5538-G-SS-1023-00)
(PB84-129808; LC-82-062536; ISBN-0-309-03386-1; NRC-33)
Avail: NTIS HC A06/MF A01 CSCL 21D

Information is summarized on alcohol fuel technologies for planners, investors, and technical assistance agencies in developing countries. Although the information is primarily aimed at the non-technical reader, it does contain some details of the technologies: references are included for those who wish more specialized information. The production and use of alcohol fuels, the production of ethanol and methanol, the social, economic and environmental implications of using alcohol fuels, positive and negative factors of using alcohol fuels are given. Tropical crops and their conversion to alcohols through both traditional and novel processes are discussed. GRA

N84-18429# Gas Research Inst., Chicago, Ill. Substitute Natural Gas Supply Research Dept.
GUIDELINES FOR EVALUATION OF COMMERCIAL FOSSIL FUELS GASIFICATION CONCEPTS
Howard S. Meyer Mar. 1983 96 p
(PB84-132570; GRI-83/0003) Avail: NTIS HC A05/MF A01 CSCL 21D

The Guidelines for Evaluation of Commerical Fossil Fuels Gasification Concepts contain all the information and procedures that are required to make consistent economic and technical comparisons of various gasification technologies and to compare gasification with other energy sources. Assumptions about resources, facilities, estimating and economics for conceptual first-of-a-kind grass roots plant are described. A process development allowance methodology (PDA) is described to adjust the estimated cost to account for experience that shows the actual cost of facilities always exceeds the cost estimated when development is incomplete and the concept is not completely defined. These Guidelines updata the 'Coal Gasification Commerical Concepts-Gas Cost Guidelines-Revision 1'. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-18430*# National Aeronautics and Space Administration, Washington, D. C.
AIR-JET MILLING OF GRINDING MATERIALS
Kazimierz Wozniak and Andrzej Wallisch Nov. 1983 17 p refs Transl. into ENGLISH from Szklo Ceram. (Poland), v. 32, no. 4, 1981 p 69-73 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77366; NAS 1.15:77366) Avail: NTIS HC A02/MF A01 CSCL 13I

The principles of air-jet milling of fine powders and the influence of air pressure and milling intensity are discussed. Impact, abrasion, and resultant grain shape are also considered. Author

N84-18431# Council for Scientific and Industrial Research, Pretoria (South Africa). Production Engineering Advisory Service.
MINI-SEMINAR ON JOINING TECHNIQUES
Aug. 1982 77 p refs Seminar held in Pretoria, Aug. 1982
(CSIR-TSD-0005/82; ISBN-0-7988-2361-5) Avail: NTIS HC A05/MF A01

Various topics relative to resin bonding are discussed. The use of epoxy resins for metal bonding, applications for anaerobic sealants and adhesives, brazing, cold working techniques for producing internal threads, friction welding, and the welding of thermoplastic and thermosetting resins are among the topics discussed. For individual titles, see N84-18432 through N84-18437.

N84-18432# Ciba-Geigy (Pty) Ltd., Biel (Switzerland). Plastics Sub-Div.
RESIN BONDING OF STRUCTURAL MEMBERS
L. Peace *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 9 p (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

The use of epoxy resins for metal bonding is discussed. Surface preparation using solvent degreasing, detergent degreasing, chemical etching, primer coating, and sand blasting is discussed. The advantages of structural adhesive bonding and the applications for epoxy based structural adhesives are surveyed. R.J.F.

N84-18433# Loctite S.A. (Proprietary) Ltd. (South Africa).
APPLICATIONS FOR ANAEROBIC ADHESIVES, WITH PARTICULAR REFERENCE TO THE REPLACEMENT OF CONVENTIONAL LOCKING DEVICES
M. Campbell *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 13 p (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

Applications for anaerobic adhesives are discussed. Anaerobic sealants and adhesives are liquids with cure at room temperature in the absence of air, but which remain liquid while exposed to air. Their use in replacing or augmenting purely mechanical means for locking, sealing, retaining, and structurally bonding machine

elements is discussed. Fastener failure is discussed, especially failure due to vibrational stresses. R.J.F.

N84-18434# Brazebright Industries (Proprietary) Ltd. (South Africa).
FURNACE BRAZING: A MASS PRODUCTION METHOD FOR PRODUCING HIGH STRENGTH JOINTS
C. B. Zlotnick *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 15 p (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

The principles of brazing in general, and furnace brazing in particular, are discussed. The applicability, advantages, and limitations of brazing are outlined with the aim of making engineers aware of this method of joining as a viable alternative to other bonding techniques. R.J.F.

N84-18435# Council for Scientific and Industrial Research, Pretoria (South Africa).
COLD-FORM TAPPING OF INTERNAL THREADS
P. H. H. Trendler *In its* Mini-Seminar on Joining Tech. Aug. 1982 10 p refs (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

An alternative to conventional tapping, cold-form tapping differs from conventional tapping in that it is a forming rather than a cutting process. The cold-form tapping is chipless since the thread is generated by a succession of deeper penetrating lobes on the tapered end of the tap. The thread is formed as the displaced material is pushed together axially between the lobes when the tap rotates into the hole. The results of comparative performance tests using various tap geometries, workpiece materials, and lubricants are presented. R.J.F.

N84-18436# Projects Expedited (Proprietary) Ltd. (South Africa).
FRICTION WELDING **c37**
G. B. Murray *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 14 p refs (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

The processes of friction welding are discussed. The advantages and disadvantages are surveyed. General applications of friction welding, as well as some novel applications like the use of portable friction welding machines built to plug 13 mm diameter holes in a power station, are discussed. R.J.F.

N84-18437# Emaillit-Proderite Cape (Proprietary) Ltd. (South Africa). PVC Div.
WELDING OF THERMOPLASTICS **c37**
A. Chalef *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 12 p (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

Various methods of welding thermoplastic resins and thermosetting resins are discussed. Electric, friction, ultrasonic, and extrusion techniques are discussed. Weld testing methods are discussed. R.J.F.

N84-18438# South African Inst. for Production Engineering, Pretoria.
FOURTH SEMINAR ON EFFICIENT METAL FORMING AND MACHINING
1982 244 p refs Seminar held in Pretoria, 16 Nov. 1982 Prepared in cooperation with CSIR, Pretoria, South Africa
(ISBN-0-7988-2556-1) Avail: NTIS HC A11/MF A01

Topics in metal working and forming are addressed including grinding and finish milling, cold forming, extruding, broaching, and cutting technologies. Machine and tool designs are also discussed. For individual titles, see N84-18439 through N84-18453.

N84-18439# Hauni-Werke Koerber und Co., Hamburg (West Germany).
CREEP FEED GRINDING: ADVANCED PROFILE GRINDING TECHNOLOGY
Ulf Petersen *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 18 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

Two variants of profile grinding, reciprocate grinding and creep feed grinding, are described and compared in terms of metal removal capacity, grinding force, wheel wear, heat generation, and surface finish. Methods of continuous dressing are also discussed. Finally, the design and production advantages of continuous path controlled (feed controlled) dressing and grinding techniques are examined. M.G.

N84-18440# ISCAR Ltd., Nahariya (Israel).
THERMAL PROPERTIES OF COATING MATERIALS AND THEIR EFFECT ON THE EFFICIENCY OF COATED CUTTING TOOLS
R. Porat and R. Yaniv (ISCAR SA Ltd., Kempton Park, South Africa) *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 7 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

Various combinations of coating layers -- of carbides, nitrides and oxides on substrates of cemented carbides -- produced by the chemical vapor deposition process and the resulting increases in tool life and machining speeds are discussed. The thermal conductivity of both carbides and nitrides increases with higher temperatures, but at a lower value for nitrides than carbides; whereas the thermal conductivity of oxides decreases with an increase in temperature. It follows, therefore, that at low machining speeds there is an advantage to coating with nitrides, and at high machining speeds there is an advantage to coating with oxides. A combination of the two on the tool surface gives the best ability to withstand wear in a wide range of machining speeds. When combining both at the surface layer, and also at the layer lying between the surface and the substrate, the result in addition to good wear resistance is an increased ability to withstand high cutting speeds without actual damage to the tool itself. M.G.

N84-18441# De Beers Diamond Research Lab., Johannesburg (South Africa).
THE CURRENT STATUS OF DIAMOND AND CUBIC BORON NITRIDE COMPOSITES **c24**
P. N. Tomlinson and R. J. Wedlake *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 10 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

The development of high pressure technology which allowed the synthesis of diamond and cubic boron nitride also resulted in the production of a range of ultra-hard ceramic-type materials. These materials, polycrystalline diamond and cubic boron nitride composites, offer distinct advantages over their single crystal counterparts. The mechanism of composite formation, their properties, and their applications are discussed. M.G.

N84-18442# Prototyp Werke, Zell (West Germany).
ECONOMIC ROUGHING AND FINISH MILLING WITH END MILLS MADE OF HIGH SPEED TOOL STEEL CLASS HSSE: HIGH COBALT ALLOYED
Heinz Klammer *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 24 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

Technological advances made in the manufacture of high cobalt alloyed milling cutters are illustrated. In particular, the machining of stainless steel (i.e., AISI 310, 316, etc.) and the machining of aluminum in the aircraft industry with roughing and finishing end mills are discussed. M.G.

N84-18443# Mitco Tool Co., Pietermaritzburg (South Africa). Cutting Tool Div.
HIGH SPEED STEEL SPECIAL CUTTING TOOLS: THEIR DESIGN AND APPLICATION
In South African Inst. for Production Engineering Fourth Seminar G.M.N. Hills in South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 23 (For primary document see N84-18438 09-31)

The design characteristics of special high speed steel (HSS)

tools used in the hole making and milling areas of metal machining are presented, together with a brief discussion on the versatility offered by the tool material itself. The influence of component and cutter material on cutter life is covered, as are the characteristics of the popular grades of high speed steel in relation to this important factor in production costs. Attention is also given to the resharpening of special cutters, and to the factors influencing the availability and the cost of HSS specials. M.G.

N84-18444# Aluminium Extrusion Co. (Proprietary) Ltd., Elandsfontein (South Africa).
ALUMINIUM EXTRUSION: A METAL FORMING PROCESS **c26**
C. E. Ulyate *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 8 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

The aluminum extrusion process is described and the advantages of the process for the manufacturing industry are defined. The process is fundamentally one of pressing a billet of aluminum through a profile cut into a die. The die maker is able to cut almost any profile into die steel. This versatility enables the extruder to provide the end user with an almost unlimited range of shapes. These shapes can be provided in lengths of up to 15 meters. Other methods of forming metal into the shapes required by fabricators are extremely labor intensive and often require special skills. Processes such as bending and machining may have a labor component of as much as 80% of the final cost of the article. By comparison the cost of labor in an aluminum extrusion would be around 15%. In many cases, therefore, significant savings can be shown in the fabrication process through the use of extrusions. Examples are given to justify this view. M.G.

N84-18445# South African Inst. for Production Engineering, Pretoria.
COLD FORMING AND UPSETTING IN THE FASTENER INDUSTRY **c37**
A. R. Wiggins *In its* Fourth Seminar on Efficient Metal Forming and Machining 1982 8 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

In the manufacture of the vast range of products which are loosely termed fasteners there are three major cold forming processes which are employed, namely, cold heading, impact extrusion and thread rolling. There are, of course, many other processes and operations which are carried out in order to achieve the final product, such as shearing, piercing, thread cutting, bending etc., but the processes discussed are confined to the ones which alter the shape of the metal by causing it to flow plastically into the required form. Author

N84-18446# Witwatersrand Univ., Johannesburg (South Africa). Dept. of Metallurgy.
METAL FORMABILITY IN BULK DEFORMATION PROCESSES **c26**
E. Ulvan and A. Doursaris *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 29 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

A number of mechanical tests for the measurement of metal formability are described. The compression test is considered in some detail and its uses are demonstrated in obtaining forming limit lines and information about the feasibility of forming processes. Author

N84-18447# Huletts Aluminium Ltd., Pietermaritzburg (South Africa).
THE MANUFACTURE AND FINISHING OF ALUMINIUM EXTRUSION DIES **c26**
I. H. Rowsell *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 13 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

Modern developments in the manufacture and finishing of extrusion dies for the aluminum industry are discussed. A CAD/CAM approach is described which allows the initial extrusion shape design input to be used directly for the cutting of dies. In particular, the application of electric discharge machining in the form of CNC wire-cutting and orbital machining is presented as a means of improving the effectiveness of an extrusion operation. The finishing of extrusion dies by automatic means is included. Author

N84-18448# National Productivity Inst., Pretoria (South Africa).
PRODUCTIVITY AND THE FORGING INDUSTRY
A. Stocking *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 30 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

The ways in which the machinery, manpower, material, and money may be applied in more productive and profitable ways within the forging industry of South Africa are discussed from a practical viewpoint. The basic aspects of forging plant selection are discussed in an attempt to help management within the industry make the best choice of forging machine and correctly choose its capacity for the market sector for which it is aimed. Some information is given on furnaces and ancillary forging equipment as well as on estimates of the cost of heating in the forge. Author

N84-18449# AECI Ltd., North Rand (South Africa). Maintenance and Industrial Engineering.
PRODUCTIVITY IMPROVEMENT IN A JOBBING SHOP
P. J. J. duPreez *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 7 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

Workshop planning, manufacturing drawings, work measurement, job costing, and quality control and assurance influence productivity in a production but are much more important in a jobbing shop. Where and how these parameters influence jobbing shop more severely than a production shop are examined. A.R.H.

N84-18450# South African Inst. for Production Engineering, Pretoria. Manufacturing Systems.
BROACHING TODAY **c37**
A. C. Turner *In its* Fourth Seminar on Efficient Metal Forming and Machining 1982 9 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

The broaching process which may be applied in machining holes or other internal surfaces and also to many flat or other external surfaces is described. Internal broaching is applied in forming either symmetrical or irregular holes, grooves or slots in machine parts. It is very rapid and accurate and leaves a finish of good quality. This process is employed extensively in automotive and other plants where duplicate parts must be produced in large quantities, frequently to given dimensions with small tolerances. Author

N84-18451# Gleason Works, Rochester, N.Y. Machine Div.
ADVANCED FINISHING METHODS FOR SPIRAL BEVEL AND HYPOID GEARS **c37**
W. R. McVea *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 15 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

Rapid advances made in finishing techniques for bevel and hypoid gears include methods for improving finish on both soft and hard gears and correcting distortion caused by hardening of the gears. Traditional finishing methods using coated cutter blades are discussed and processes such as hard finishing using carbide tipped cutter blades and cubic boron nitride grinding wheels are introduced. Author

N84-18452# TRUMPF G.m.b.H. und Co., Ditzingen (West Germany). Sales and Application Technique.
LASER CUTTING: AN ADVANCED TECHNOLOGY IN SHEET METAL WORKING **c36**
E. O. Herb *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 8 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

The importance of the laser technology in sheet metal working, especially as regards the cutting of sheets is covered. The demands on the laser beam quality during the beam generation are discussed just as the prerequisites placed on the guide machine if the laser tool is to yield the working results as demanded by the workshop for the industrial utilization. The physical properties of the materials which are necessary for the thermal cutting process with laser are considered. Author

N84-18453# National Physical Lab., Teddington (England).
FUNDAMENTAL APPROACH TO DESIGN AND PREDICTION OF PERFORMANCE OF FORMING TOOLS **c37**
E. A. Almond and M. G. Gee *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 16 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

By using probabilistic fracture mechanics it should eventually be possible to replace the empirical approach to tool design by a method that enables safe working-loads and tool lives to be assessed statistically from a combined knowledge of the stress field in the tool, and fracture toughness, strength, and defect population of the tool material. The application of the approach to predicting failure rates is illustrated for a cold heading die used in fastener manufacture by performing a stress analysis, by determining the positional failure probability-density, and by calculating the failure probability of the die under static and cyclic loading. It is shown that the approach offers significant advantages for tool design and failure rate prediction, but that the sparsity of information on the relevent material properties and tool operating conditions can restrict progress on its application. Author

N84-18454# European Space Agency, Paris (France).
FIRST EUROPEAN SPACE MECHANICS AND TRIBOLOGY SYMPOSIUM
T. D. Guyenne, ed. and J. J. Hunt, ed. Dec. 1983 215 p refs Partly in ENGLISH and FRENCH Proc. held at Neuchatel, Switzerland, 12-14 Oct. 1983; sponsored by ESA, Laboratoire Suisse de Recherches Horlogeres and Association Suisse pour les Techniques Spatiales
(ESA-SP-196; ISSN-0379-6566) Avail: NTIS HC A10/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The design and testing of solar array mechanisms, Giotto spacecraft mechanisms, the Spacelab Airlock, space shuttle orbiter rudder/speed break actuators, and remote handling devices were discussed. Stiffness, torque, thermal conductance, and lubrication of spacecraft ball bearings were considered. Magnetic bearings, stepping motors, and reaction wheels were treated. For individual titles, see N84-18455 through N84-18477.

N84-18455# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
SLIDING ELECTRIC CONTACTS IN SPACE: OBSERVATIONS ON EXISTING TECHNOLOGY AND NEW TRENDS IN LOW-SPEED APPLICATIONS **c33**
E. W. Roberts *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 3-10 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

It is shown that sliding electrical contacts employing silver/molybdenum disulfide composite brushes develop high contact resistances and contacts which exhibit a negative temperature coefficient of resistance. Such effects are due to the susceptibility of silver or molybdenum disulfide to atmospheric contamination, or to the electronic properties of intrinsic MoS2 or a combination of these. Improvement in contact reliability might be obtained by operating low speed slip rings without lubrication and employing alternative contact materials, such as alloys which better resist tarnishing. Such tarnish-resistant materials must be capable of withstanding the development of electrically-resistive films as a result of atmospheric exposure. Miniature slip rings operating without lubrication are shown to be effective for low current signal transmission. It is shown how metallic fiber brushes are capable of high current transmission at low brush loads such that lubrication may be unnecessary. Author (ESA)

N84-18456# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DYNAMIC ANALYSIS OF A BEARING AND POWER TRANSFER ASSEMBLY (BAPTA) SOLAR GENERATOR SYSTEM **c44**
C.-Ch. Etzler *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 11-17 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The dynamic behavior of a solar array turned by a BAPTA was investigated by mathematical simulations to establish the capability of the drive. A simple model was extended with details of the hardware, to ensure that significant elements are accounted for. Results derived from physical data and requirements of a planned TV-satellite indicate that all parameters are accounted for. Author (ESA)

N84-18457# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
DESIGN AND DEVELOPMENT OF AN ADVANCED SOLAR ARRAY DRIVE MECHANISM **c44**
J. S. Sheppard *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 19-26 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The design and development of a solar array drive capable of transferring 7kW of power or more is described. Results of functional performance and environmental tests encompassing L-SAT/Olympus qualification levels are summarized. The drive consists of power slip ring, bearing support, drive actuator, and pyro/signal slip ring modules. Thermal vacuum, accelerated life test, and vibration tests are satisfactory. Author (ESA)

N84-18458# Contraves Corp., Zurich (Switzerland). Dept. EKR.
SPACE TELESCOPE: SOLAR ARRAY PRIMARY DEVELOPMENT MECHANISM **c37**
A. Veit and D. Chandler *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 27-34 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

A Primary Deployment Mechanism (PDM) powered by redundant stepper motors was developed for the primary deploy and stow operations of the Space Telescope solar array. The mechanism locks the array boom in the deployed position and releases the boom at the end of mission for restowing before capture and Earth return via space shuttle. Due to a continual growth in the design load of the PDM, the system exhibited instabilities. A redesign introduced a planetary gear train between the motors and the primary lever arms. This results in a very stable system, allowing for increase in system load if required. Three flight models were successfully tested. Acceptance testing, besides ambient operational tests, included vibration and thermal vacuum tests with operational testing being included in the thermal vacuum environment. Author (ESA)

N84-18459# European Space Research and Technology Center, Noordwijk (Netherlands).
THE GIOTTO MECHANISMS AND THEIR FUNCTIONS **c37**
F. Felici *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 37-45 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The Giotto spacecraft antenna pointing mechanism, thermal control shutters, and kick motor nozzle closure mechanism are described. The antenna mechanism is driven by a stepper motor used in synchronous mode and has dry lubricated angular contact bearings (lead ion plated) offloaded during launch and perigee motor firing. In each shutter a small stepper motor rolls and unrolls a foil of gold plated Kapton in front of a radiator and is controlled by a remote electronic unit. The closure mechanism shields the nozzle from cometary dust impacts during the encounter phase, to prevent contamination of experiments due to carbon particles released by the nozzle itself under dust bombardment; provides a continuous equipotential surface in the leading face of the spacecraft; and prevents heat leaks. Author (ESA)

N84-18460# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost.
SPACELAB SCIENTIFIC AIRLOCK **c18**
W. A. denHaak *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 47-54 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The Spacelab Airlock experiment table and its drive mechanism are described and uses of the Airlock are indicated. The table carries payloads up to 150 kg in zero g conditions. It can be extended into space and/or retracted into the Spacelab module. Payloads can be attached and removed in orbit or on the ground. Experiments can be electrically connected to the Spacelab module. The table is driven by a hand controlled drive system using cables and drive chain. It can be locked in any intermediate position. In the stowed position the table is locked between removable stophooks and an interlock system. Incorrect operational sequences are prevented by mechanical locks. Author (ESA)

N84-18461# Rockwell International Corp., Downey, Calif. Shuttle Orbiter Div.
SPACE SHUTTLE ORBITER RUDDER/SPEED BRAKE ACTUATION SYSTEM **c16**
Dwight Woolhouse *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 55-61 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

A mechanical-hydraulic actuation system for control of the rudder and speed brake aerosurfaces of the Space Shuttle orbiter is described. The rudder/speed brake functions are combined in a split-panel rudder design, mounted at the trailing edge of the large vertical stabilizer. Actuation of both panels in the same direction provides conventional rudder (yaw) control; actuation differentially, in a flared configuration, results in added aerodynamic drag for control of speed and pitch. Panel actuation is accomplished by a hydromechanical system responding to quadredundant avionic command inputs. The system consists of a power conversion and control component, the power drive unit, 4 geared rotary actuators, and 10 torque transmitting drive shafts. Author (ESA)

N84-18462# Centre National d'Etudes Spatiales, Toulouse (France).
ELECTROMAGNETIC DESIGN OF A REMOTE MANIPULATOR ARM FOR SPACE APPLICATIONS [CONCEPTION ELECTROMAGNETIQUE D'UN BRAS TELEMANIPULATEUR POUR APPLICATIONS SPATIALES] **c54**
L. Petitjean and J. C. Binder (Crouzet, Valence, France) *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 63-71 In FRENCH (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The electromagnetic design of a satellite remote manipulator arm for handling other satellites in orbit is discussed. A design in which the chaser satellite roughly positions the arm relative to the target, and then guides the arm using optical or extremely high frequency sensors is considered. A decentralized dc drive motor is proposed. Potentiometers are used for position detection, tachometric generators for velocity detection. A parallel fixed axes configuration is retained for the joints. Author (ESA)

N84-18463# Societe Nationale Industrielle Aerospatiale, Cannes (France).
FAILURE MODE PREDICTION ANALYSIS USING THE RELIABILITY INFORMATION SOFTWARE (RIF) [L'ANALYSE PREVISIONELLE DES MODES DE DEFAILLANCE A L'AIDE D'UN PROGICIEL DENOMME SYSTEME D'INFORMATIONS FIABILITE] **c38**
T. deMollerat and J. P. Courtin (Societe d'Etudes des Systemes d'Automation) *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 73-77 In FRENCH (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The Reliability Information Software (RIF) for spacecraft component failure prediction is outlined. The RIF describes failure modes, failure effects, cause of failure, and solution. It provides a reliability estimate on a component, subsystem or system level. It uses an IBM 370 computer. Author (ESA)

N84-18464# Sener, S.A., Madrid (Spain).
ACCURACY IN FOLDING MIRROR MECHANISM DISPLACEMENT LAW **c74**
E. Herrera *In* ESA First European Space Mech. and Tribiogy Symp. Dec. 1983 p 79-88 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The Space Telescope faint object camera refocusing mechanism is described. Selection of the articulation elements; their influence on the mirror displacement law; and breadboard tests are described. The axis system (flexural pivots) is outlined. A method which uses the center shift to correct displacement law defects is summarized. Author (ESA)

N84-18465# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
THE STIFFNESS TORQUE AND THERMAL CONDUCTANCE OF THIN-SECTOR FOUR-POINT CONTACT BALL BEARINGS FOR USE IN SPACECRAFT MECHANISMS **c37**
R. A. Rowntree *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 91-100 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The torque, radial thermal conductance and stiffness of thin section four point contact ball bearings were determined for varying load, internal preload, axial clamping force, lubricant and cage type. Stiffness is principally dependent on the axial clamping force at low values of internal preload and becomes less dependent at higher values. Bearing conductance and torque were measured in vacuum over thermal gradients of + or - 10C across the races. Both show dependence on internal preload, axial clamping force and lubricant. Conductance rises linearly with thermal gradient while torque follows an almost square law relationship. The development of internal clearance gives a small constant torque and low conductance. Cage type is unimportant. Author (ESA)

N84-18466# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
COMPUTATIONAL METHODS FOR BALL BEARINGS IN SPACECRAFT **c37**
M. J. Todd *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 101-108 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

Computation of ball load, contact angle, dry frictional torque, ring deflection, ball speed/position variation and thermal conductance from a mixture of rolling contact theory, experimental measurement and empirically based assumptions is outlined. If viscous losses can be ignored, the remaining Coulomb frictional torque may be estimated from a theoretical model in which microslip, hysteresis and spin are assumed to act independently. Thermally imposed strains and the mitigating effect of structure compliance can be assessed by iteration methods. Although no complete torque prediction treatment exists ball speed/position variation can be computed as a function of degree of misalignment.

Since heat conductance across a dry Hertzian contact area is proportional to the area itself, dry conductance for a ball bearing can be easily computed and used as a worst case value in thermal modelling of the mechanism. Author (ESA)

N84-18467# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
SOME OBSERVATIONS ON THE PERFORMANCE OF FOMBLIN Z25 OIL AND BRAYCOTE 3L-38RP GREASE IN BALL BEARINGS AND GEAR BOXES c37
K. T. Stevens *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 109-117 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

Ball bearings lubricated with Fomblin Z25 oil (a perfluoroether fluid with low vapor pressure and a high viscosity index) were vacuum tested. A gear box lubricated with PTFE-thickened grease based on Fomblin Z25 was also tested. Results show that there is a problem of polymerization inherent in the oil, initiatied by active metal surfaces produced by rolling or rubbing. The resulting degradation products and component wear are observed in ball bearings operating at different speeds (giving boundary and elastohydrodynamic conditions) and also in the gear box. Better performance results when there is a trace of hydrocarbon in the oil (for example, when a rust preventative is added to the grease) but this addition increases the vapor pressure.
Author (ESA)

N84-18468# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).
MOISTURE RESISTANT MoS2-BASED COMPOSITE LUBRICANT FILMS c27
P. Niederhaeuser, M. Maillat, and H. E. Hintermann *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 119-123 refs Sponsored by Kommission zur Foerderung der Wissenschaftlichen Forschung (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The interaction of oxygen and metal-sulfur bond on the adhesion of lubricating chalcogenide films was examined. Results show that the moisture resistance of MoS2 films can be increased by sputtering MoS2 mixed with water repellent additives. To increase adhesion of such coatings and prevent corrosive attack of the substrate, a sulfide forming intermediate layer is applied previously on the functional surface. The obtained composite coatings are durable in Earth atmosphere and adhere well to their support. Friction and wear results confirm improvements.
Author (ESA)

N84-18469# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).
LUBRICATION OF MOUNTINGS SUBJECT TO CONTACT CORROSION c37
M. Maillat, H. Boving, and H. E. Hintermann *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 125-129 refs In FRENCH (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

Antifretting coatings for spacecraft components were tested on a cylindrical simulator. Results show that TiC is effective with steel. Tiolube 1175 is good with steel, on titanium protected by Tiodize 2, and on anodized aluminum. Tiodize E20 is also very effective on anodized aluminum. The best coatings consist of a lubricating part on an support treated to resist wear and oxidation.
Author (ESA)

N84-18470# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
THE TRIBOLOGY OF GEARS FOR SATELLITE APPLICATIONS c37
K. I. Stevens *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 131-146 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

Friction and wear data, and material/lubricant combinations for satellite gears are outlined. Plasma nitrided gears give low wear, even when running dry against themselves and are recommended in preference to through-hardened or precipitation hardened steel gears. Grease, oil and dry lubrication (MoS2 or lead) all reduce wear. The MoS2-filled polyimide gears have the lowest wear rate of plastic materials examined and can be used in light duty, low precision applications. Oil-filled porous polyimide performs poorly. Light anodized aluminum alloy gears running against themselves fail by cracking of the hard, thin coating but performance is improved by running with MoS2 or operating against plastic gears. Gear tooth wear rate is proportional to the square root of load and is independent of speed. Author (ESA)

N84-18471# European Space Research and Technology Center, Noordwijk (Netherlands).
A RATIONALE FOR THE TESTING OF SPACE MECHANISMS c39
H. M. Briscoe *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 149-156 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

A rationale for space mechanism testing which represents the minimum required to achieve reliability over a lifetime of 7 to 10 years is presented. The importance of control by product assurance procedures and the type of documentation required to implement it are discussed. Author (ESA)

N84-18472# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
ACHIEVEMENT OF RELIABILITY BY THERMAL VACUUM TESTING OF SPACECRAFT MECHANISMS c38
K. Parker and J. A. Duvall *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 157-165 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

Thermal vacuum test chambers, vacuum pumps and instrumentation systems are presented. Application test controls and management systems to maintain standards cost effectively is described. Two 7 yr real life tests, on a solar array drive mechanism and a despin mechanism, are used to illustate the benefits of the tests. Author (ESA)

N84-18473# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
COMPUTERISED DATA ACQUISITION AND CONTROL METHODS AS RELATED TO MECHANISMS TESTING c37
S. G. Bamford *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 167-175 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

A spacecraft component test philosophy, and its application in the selection, development and use of a computer controlled test system for mechanisms are outlined. The reasons for adopting a computerized test philosophy are given and the criteria used to select computerised test equipment are discussed. Input and output signals and stimuli used for testing are summarized. The control and acquisition of these quantities by computer program is described. Multitasking in a computer language and its use for complex control and data acquisition are also discussed.
Author (ESA)

N84-18474# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
MAGNETIC BEARING DESIGN FOR HIGH SPEED MOMENTUM WHEELS c37
Th. Lange *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 179-185 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

The impact on rotor and satellite dynamics of the design of magnetic bearings for high speed magnetic bearing momentum wheels is discussed. Tests on two different types of wheel show

that critical dynamic interaction is due to rotor induced eddy currents. The resulting performance limitations are strongly dependent on the kind of bearings. Author (ESA)

N84-18475# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
BAE REACTION WHEELS FOR OLYMPUS c37
G. J. Sturtivant *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 187-192 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF/ A01

The design philosophy and achievements of the Olympus reaction wheel are presented. The design incorporates a compliant bearing preload arrangement which reduces the launch phase loads applied to the bearings. The fiber optic commutation sensor system is described, together with the four-phase brushless, ironless dc electric motor which achieves a very low output torque ripple. Author (ESA)

N84-18476# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
A HIGH RESOLUTION STEPPING MOTOR c33
W. Auer and G. Ruff *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 193-196 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

Direct drive stepping motors were developed, qualified and life tested for gimbal systems and other space mechanisms. A diaphragm suspended rotor rolls on a stator rim in a conning manner. Due to a difference in the radii of stator and rotor (defined by conning angle) a large reduction ratio can be achieved. The conning motion is activated by sequential energizing of coils on the circumference of the stator. The stator and rotor are coupled by friction or by teeth. The diaphragm allows the conning motion and transforms the rotational advance to the output axis. This compromise has disadvantages, especially where such a motor also performs the function of an accurate incremental pick-off. A stepping motor with a separation of the rotor suspension from the rotational coupling was developed (employing a ball joint and a bellow) and qualified for a northseeking gyroscope. Author (ESA)

N84-18477# European Space Research and Technology Center, Noordwijk (Netherlands).
EUROPEAN TECHNOLOGY REQUIREMENTS ON SPACE AUTOMATION AND TELEOPERATION
J. J. Capart *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 197-203 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

A development strategy for space manipulator mechanisms is outlined. It shows that current mission studies cannot specify accurate technical objectives and priorities. The ESA reference concepts, one dealing with an experiment manipulator, the other with a service and maintenance system, are introduced. A component development effort aimed at demonstrating hardware in a relatively short time, using experience obtained with ground-based applications as far as possible is described. Author (ESA)

N84-18478# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
COMPENDIUM OF ABSTRACTS ON STATISTICAL APPLICATIONS IN GEOTECHNICAL ENGINEERING Final Report
Mary Ellen Hynes-Griffin, ed. and G. Wendell Deer, ed. Sep. 1983 567 p
(AD-A136355; WES/MP/GL-83-27) Avail: NTIS HC A24/MF A01 CSCL 13/2

The results of a literature search of geotechnical and statistical abstracts are presented in tables listing specific topics, title of the abstract, main author and the file number under which the abstract can be found. Author (GRA)

N84-18479# Clemson Univ., S.C. Dept. of Civil Engineering.
STRENGTH OF ANCHOR BOLTS IN MASONRY Final Report
A. R. Whitlock and R. H. Brown Aug. 1983 182 p refs
(Grant NSF PFR-78-06095)
(PB84-11160; NSF/CEE-83201) Avail: NTIS HC A09/MF A01 CSCL 13C

The strength properties of bent bar bolts in masonry were evaluated. The variables studied include bolt size, loading direction, embedment substrate, and bolt location. It is found that bolt strength increases with bolt size up to the point where failure is controlled by masonry strength. The loading direction, substrate, and location of bolts are shown to be significant factors in the strength of anchors. Previously developed empirical and analytical design equations for anchor bolts in reinforced concrete and masonry are investigated and compared to the study results. The equations are found to accurately predict the mean strengths of anchor bolts. GRA

N84-18480# Earthquake Engineering Research Inst., Berkeley, Calif.
SEISMIC BEHAVIOR OF ACTIVE BEAM LINKS IN ECCENTRICALLY BRACED FRAMES
K. D. Hjelmstad and E. P. Popov Jul. 1983 178 p refs
(Grant NSF CEE-81-07217)
(PB84-119676; UCB/EERC-83/15) Avail: NTIS HC A09/MF A01 CSCL 13M

An eccentrically braced flame is a structural framing system in which the axial forces in the braving members are transferred either to other braces or to columns through shea and bending in short beam segments called active links. The active link acts as a fuse, dissipating large amounts of input energy upon lateral overloading of the structure and its behavior dominates the behavior of the structure. While experiments have demonstrated the good global behavior of the framing system, the inelastic behavior of the active links was not adequately evaluated, especially as regards the web buckling phenomenon. Furthermore, rigorous analytical tools for the inelastic analysis of the active link elements, and therefore eccentrically braced frames, appear to be lacking. GRA

N84-18481# National Bureau of Standards, Washington, D.C. National Engineering Lab.
CALCULATIONS OF WALL FIRE SPREAD IN AN ENCLOSURE
K. D. Steckler Nov. 1983 76 p refs Sponsored in part by Dept. of Health and Human Services and Armstrong World Industries
(PB84-123165; NBSIR-83-2765) Avail: NTIS HC A05/MF A01 CSCL 13M

Mathematical models of fire growth in enclosures offer a potential for assessing the risk of materials with respect to a hazard such as flashover. The development of a model for fire spread over wall lining materials is presented. The work covers the development of a transient two layer zone model, initially formulated for crib fires in a room, then adapted to simulate a spreading corner wall fire. The local wall flame spread rate and burning rate per unit are expressed in the model as functions of the external radiation incident upon the burning surface and the oxygen concentration in the adjacent gas layer (zone). Flame spread is limited to the horizontal direction. Results for a fictitious wall lining material are presented. Major elements of the results are shown to be in qualitative agreement with experience. GRA

N84-18482# Northwestern Univ., Evanston, Ill. Center for Concrete and Geomaterials.
MECHANICS OF GEOMATERIALS: ROCKS, CONCRETES, SOILS. PREPRINTS, WILLIAM PRAGER SYMPOSIUM
Zdenek P. Bazant, ed. Sep. 1983 669 p refs Symp. held in Evanston, Ill., 11-15 Sep. 1983 Sponsored in part by International Union of Theoretical and Applied Mechanics
(Grant NSF CEE-82-08208)
(PB84-112812) Avail: NTIS HC A99/MF A01 CSCL 08M

The phenomena described by constitutive relations for rock and concrete is reviewed. Following this, various approaches to materials categorization are discussed with particular reference to time independent behavior. Some theories developed particularly for rock and concrete are then discussed from the view of path

dependence and coupling of degradation and plastic deformation. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-18483# British Broadcasting Corp., Kingswood (England). Engineering Div.
EXPERIMENTAL DIGITAL STEREO SOUND WITH TERRESTRIAL TELEVISION: FIELD TESTS FROM WENVOE, OCTOBER 1983
S. R. Ely Dec. 1983 40 p refs
(BBC-RD-1983/19) Avail: British Broadcasting Corp., Kingswood Warren, Tadworth, Surrey, Engl.

An experimental digital system to carry two high quality sound channels with the existing terrestrial television transmission System I was devised. This experimental system uses a 4-phase d.p.s.k. modulated second sound carrier spaced at about 6.55 MHz above the vision carrier and at a level of 20 dB below it. Within the spectrum space available a data rate of about 700 kbit/s can be provided, which is capable of carrying a stereo sound pair of signals, or two independent sound signals. The existing analog f.m. sound carrier at 6 MHz above the vision carrier is retained to maintain compatibility with existing receivers, but is slightly reduced in level to 10 dB below the vision carrier in order to avoid picture patterning due to beats between the sound carriers. Over-air field tests of the experimental system were conducted out of normal program hours from the BBC-2 transmitter and its associated rebroadcast relay stations. S.L.

N84-18484 Royal Aircraft Establishment, Farnborough (England).
METEOR SCATTER COMMUNICATION IN AN AIR-GROUND ENVIRONMENT
P. S. Cannon and G. Richardson 19 Jul. 1983 15 p refs
Presented at IEE Intern. Conf. on Antennas and Propagation, Norwich, England, Apr. 1983
(RAE-TM-RAD-NAV-224; BR89306) Copyright. Avail: Issuing Activity

Experimental results from forward scattering of high frequency radio signals from meteor trails for a ground to ground link are compared with theoretical predictions, and close agreement is demonstrated. The design of a very high frequency airborne meteor scatter system is addressed and it is shown to present significant problems, different in nature from those encountered in ground based systems. It is shown that experimental studies of aircraft electromagnetic noise are required before an optimal system can be designed. The reduction in data throughput due to Faraday rotation is also described. Author (ESA)

N84-18485# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
VOICE PROCESSOR FOR A SINGLE CHANNEL PER CARRIER FM EARTH STATION M.S. Thesis - 23 Dec. 1982 [PROCESSADOR DE VOZ PARA UMA ESTACAO TERRENA SCPC FM]
Naila Hoelz Colla Apr. 1983 114 p refs In PORTUGUESE; ENGLISH summary
(INPE-2707-TDL/130) Avail: NTIS HC A06/MF A01

The design of a voice processor for an SCPC FM earth station is presented. In the SCPC system, the radio frequency (RF) carrier is modulated by the information contained in a single telephone channel, so that to each telephone channel corresponds one RF channel. Emission of the carrier by the earth station occurs only in the presence of the voice signal, entailing a significant economy of power. The voice processor consists of circuits for improvement of the signal to noise ratio, voice detector for carrier activation, and echo suppressor. The improvements obtained by the compandor and preemphasis/deemphasis circuits are discussed, as well as problems found in the realization of all the circuits. The voice processor constitutes part of the earth station's channel unit, which also contains the synthesizer-modulator and the demodulator. S.L.

N84-18486# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PLURIBUS SATELLITE IMP (INTERFACE MESSAGE PROVISION) DEVELOPMENT MOBILE ACCESS TERMINAL NETWORK Quarterly Technical Report, 1 Sep. - 30 Nov. 1983
S. Blumenthal Dec. 1983 39 p
(Contracts MDA903-80-C-0353; N00039-81-C-0408)
(AD-A136256; BBN-5492; QTR-31) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Quarterly Technical Report is the current edition in a series of reports which describe the work being performed at BBN in fulfillment of several ARPA work statements. This QTR covers work on several ARPA-sponsored projects including: (1) development of the Pluribus Satellite IMP; and (2) development of the mobile Access Terminal Network. GRA

N84-18487# Boeing Co., Seattle, Wash.
DOA LOCATION ACCURACY OF A MULTIBEAM ANTENNA SYSTEM
J. P. Braun 13 Feb. 1979 65 p
(AD-A136386; D180-24987-1) Avail: NTIS HC A04/MF A01 CSCL 09/5

The purpose of this study was to analyze techniques for combining outputs from a multibeam antenna, such as a Butler Matrix or a Rotman Lens, in order to implement a direction of arrival (DOA) capability. Emphasis was placed on determining the accuracy of several DOA techniques as a function of signal-to-noise (S/N) ratio with a common antenna aperture. The impact of cross polarization and sidelobes on DOA accuracy was also considered. Study results will assist in defining antenna types for ESM systems and their performance capabilities. GRA

N84-18488# Haskins Labs., New Haven, Conn.
STATUS AND PROGRESS OF STUDIES ON THE NATURE OF SPEECH, INSTRUMENTATION FOR ITS INVESTIGATION AND PRACTICAL APPLICATIONS Interim Scientific Report, 1 Apr. - 30 Sep. 1983
A. M. Liberman 30 Sep. 1983 216 p
(Contract N00014-83-C-0083; Grants PHS HD-01994; PHS-HD-16591; PHS-N01-HD-1-2420; PHS-RR-05596; NSF BNS-81-111470; PHS-NS-13870)
(AD-A136416; SR-74/75(1983)) Avail: NTIS HC A10/MF A01 CSCL 06/16

This report is one of a regular series on the status and progress of studies on the nature of speech, instrumentation for its investigation, and practical applications. Manuscripts cover the following topics: The association between comprehension of spoken sentences and early reading ability: The role of phonetic representation; Phonetic coding and order memory in relation to reading proficiency: A comparison of short-term memory for temporal and spatial order information; Exploring the oral and written language errors made by language disabled children; Perceiving phonetic events; Converging evidence in support of common dynamical principles for speech and movement coordination; Phase transitions and critical behavior in human bimanual coordination; Timing and coarticulation for alveolo-palatals and sequences of alveolar +J in Catalan; V-to-C coarticulation in Catalan VCV sequences: An articulatory and acoustical study; Prosody and the /S/-/c/ distinction; Intersections of tone and intonation in Thai; Simultaneous measurements of vowels produced by a hearing-impaired speaker; Extending format transitions may not improve aphasics' perception of stop consonant place of articulation; Against a role of chirp identification in duplex perception; Further evidence for the role of relative timing in speech: A reply to Barry; Review (Phonological intervention: Concepts and procedures); and Review (Temporal variables in speech). GRA

N84-18489# Ohio State Univ., Columbus. Electroscience Lab.
THE PERFORMANCE OF AN LMS (LEAST MEAN SQUARE)

ADAPTIVE ARRAY WITH FREQUENCY HOPPED SIGNALS
L. Acar and R. T. Compton, Jr. Jun. 1983 45 p
(Contract N00019-82-C-0190)
(AD-A136461; ESL-714505-5) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report examines the performance of an LMS adaptive array with a frequency hopped, spread spectrum desired signal and a CW interference signal. It is shown that frequency hopping has several effects on an adaptive array. It causes the array to modulate both the amplitude and the phase of the received signal. Also, it causes the array output SINR (signal-to-interference-plus-noise ratio) to vary with time and thus increases the bit error probability for the received signal. Typical curves of the desired signal modulation and the time-varying SINR at the array output are presented. It is shown how the array performance depends on hopping frequency, frequency jump size, interference frequency, signal arrival angles and signal powers. GRA

N84-18490# M/A-COM LINKABIT, Inc., McLean, Va.
M/A-COM LINKABIT EASTERN OPERATIONS Quarterly Progress Report, 22 Dec. 1982 - 21 Mar. 1983
D. L. Mills and Z. Avramovic 31 Mar. 1983 127 p
(Contract MDA903-83-C-0024; ARPA Order 3674)
(AD-A136463; A03674; QPR-1) Avail: NTIS HC A07/MF A01 CSCL 17/2

This first Quarterly Project Report on LINKABIT's contribution to the Defense Advanced Research Projects Agency (DARPA) Internet Program covers the period from 22 December 1982 through 21 March 1983. LINKABIT's support of the Internet Program is concentrated in the areas of protocol design, implementation, testing, and evaluation. In addition, LINKABIT staff are providing integration and support services for certain computer systems to be installed at DARPA sites in Washington, D.C., and Stuttgart, West Germany. During the period covered by this report, LINKABIT organized the project activities and established staff responsibilities. Several computers and peripheral devices were made available from Government sources for use in protocol development and network testing. Considerable time was devoted to installing this equipment, integrating the software, and testing it with the Internet system. GRA

N84-18491# EIU Informatics, London (England).
EVALUATION OF A FIVE NODE VIDEOCONFERENCE SYSTEM AND SHARED GRAPHICS WORKSPACE - U.S. DEPARTMENT OF DEFENSE, WASHINGTON, D.C.
P. White Aug. 1983 49 p
(Contract MDA903-83-C-0470; ARPA Order 3855)
(AD-A136483) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes the results of an evaluation exercise carried out by the author for the Defense Advanced Research Projects Agency (DARPA) of the U.S. Department of Defense. The equipment being examined was a five node videoconference system located in Arlington, Virginia. The research looked at the system's suitability for meetings held as videoconferences. In addition much effort was spent publicizing the trial and demonstrating the equipment to various Defense Department agencies interested in videoconferencing. Using a videoconference system people from two or more sites can hold a meeting without necessarily having to travel to meet in one place. Videoconferences need not only act as substitutes for face to face meetings, but can also supplement them. Extra interim meetings can be cost justified which otherwise would not be feasible, such as short project meetings involving a lot of people. Other advantages of teleconferences are that they are reliable and can quickly be arranged. By introducing teleconference systems throughout the Defense Department, the flow of information and its effectiveness can be improved. GRA

N84-18492# North Carolina Univ., Chapel Hill. Dept. of Statistics.
ANALYSIS OF ADAPTIVE DIFFERENTIAL PCM (PULSE-CODE MODULATOR) OF A STATIONARY GAUSS-MARKOV INPUT
Neil L. Gerr and Stamatis Cambanis Jun. 1983 37 p
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A136518; AFOSR-83-1272TR) Avail: NTIS HC A03/MF A01 CSCL 20/14

An Adaptive Matched Differential Pulse-Code Modulator (AMDPCM) is analyzed. The adaptation of the symmetric uniform quantizer parameter delta sub n is performed by fixed multipliers assigned to the quantizer output levels. The input is stationary first-order Gauss-Markov. The correlation of the samples is used as the leakage parameter in the matched integrator, with the predictive reconstruction similarly matched. GRA

N84-18493# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
ROBUST PROCEDURES FOR COMMUNICATION DATA Final Report, 1 Jul. 1982 - 31 Aug. 1983
P. Papantoni-Kazakos 26 Aug. 1983 9 p
(Grant AF-AFOSR-3695-78; AF Proj. 2304)
(AD-A136540; AFOSR-83-1273TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The qualitative theory of robustness in parameter estimation was modified and extended to include robust filtering. The qualitative properties of robust filters were studied. The qualitative analysis of robust filtering and smoothing provided some specific sufficient conditions regarding the filtering and smoothing operations. A nonlinear such operation is included. Robust linear prediction and interpolation for convex and compact families of vector stationary processes were studied. The problem as a stochastic game with saddle point solution was formalized and it is found that this solution applies to a number of processed families. Such families include the family of linearity contaminated nominal processes, and the class of processes whose total energy is fixed within prespecified quantities. Robust linear filtering for convex and compact families of vector stationary information and noise processes is studied. Robust solutions for various such families are found and their performance was studied for efficiency, performance deviation, and breakdown points or curves. Properties of two dimensional random processes as applied to imaging are examined. The multiple access problem where a finite number of packet transmitting data users access a single channel while they sense the feedback only when blocked is considered. A random access, collision resolution protocol for this case is analyzed. GRA

N84-18494# Texas Univ., Austin. Dept. of Electrical Engineering.
QUANTIZATION AND DETECTION IN SIGNAL PROCESSING Interim Report, 1 Oct. 1982 - 30 Sep. 1983
Gary L. Wise Nov. 1983 14 p
(Grant AF-AFOSR-0047-81; AF Proj. 2304)
(AD-A136560; AFOSR-83-1238TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

The research topics investigated were primarily in the areas of quantization and detection in signal processing. The existence of optimal quantizers was established under very general conditions and convergence properties of sequences of quantizers to optimal quantizers were investigated. A simple and straightforward technique was presented for constructing minimum mean-squared error symmetric uniform scalar quantizers for some common input distributions. The Lloyd-Max algorithm was modified to give a very fast design algorithm for scalar minimum mean-squared error quantization. In the area of detection, a continuous time filter was designed for a discrete time problem and outperformed the corresponding discrete time detector. Detection problems were investigated when both signal and noise were modelled as phi-mixing random processes. Several situations were investigated in which asymptotic relative efficiency is an inappropriate measure of efficiency. In a different area of research, the effects of a form of nonlinear distortion on spectral properties of random processes were investigated. Author (GRA)

N84-18495# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
OPTICAL SCINTILLATION STATISTICS FOR INFRARED GROUND-TO-SPACE LASER COMMUNICATION SYSTEMS

Hal T. Yura and W. G. McKinley (TRW Space and Technology Group) 1 Dec. 1983 35 p
(Contract F04701-83-C-0084)
(AD-A136607; TR-0084(4925-04)-1; SD-TR-83-80) Avail: NTIS HC A03/MF A01 CSCL 17/2

Statistical estimates of selected scintillation parameters for an infrared laser ground-to-space communication system are presented for a point receiving aperture. The quantities estimated here are the fraction of time that the signal power is both above and below a given value, the mean number of times per second the signal power crosses a given signal level, and the mean duration of both surges and fades for a given log-irradiance variance.
Author (GRA)

N84-18496# Science Applications, Inc., McLean, Va.
WIRELESS COMMUNICATION SYSTEMS Final Report, 5 May 1980 - 22 Dec. 1982
Dennis Papadopoulos, C. L. Chang, K. Ko, A. Reiman, and V. Tripathi 1 Dec. 1983 90 p
(Contract N00173-80-C-0194)
(AD-A135830; SAI-83/1139) Avail: NTIS HC A05/MF A01 CSCL 17/2

The feasibility for producing ELF signals in the earth ionospheric waveguide, by downconverting HF pump power in the ionospheric plasma has been investigated. We have found that: (1) Interaction regions of horizontal width approx. 100 km, localized inside an ionospheric density gradient, can deplete the pump for pump powers above a threshold value. Minimum threshold is achieved for pumps propagating almost perpendicular to the density gradient (very oblique incidence) at 100 km altitude. The threshold power required is between 3-10 MW of HF, (2) The conversion efficiency from HF to ELF in the ionosphere could reach values of the order of 0.01, and (3) The scheme can operate either as an ELF generator if we use an HF pump with power 3-10 MW and a lower HF sideband with power 100 kw, or as an amplifier of ELF signals from weak ground transmitters (such as the Wisconsin test facility), or from weak space or balloon based antennas. A variation of the scheme can operate as a broadband ELF generator for jamming purposes. Author (GRA)

N84-18497# Ohio State Univ., Columbus. Lab. for Electroscience.
A USER'S MANUAL FOR ELECTROMAGNETIC SURFACE PATCH (ESP) CODE. VERSION 2: POLYGONAL PLATES AND WIRES
E. H. Newman and P. Alexandropoulos Sep. 1983 311 p
(Contract N00014-78-C-0049)
(AD-A135837; ESL-712692-3) Avail: NTIS HC A14/MF A01 CSCL 20/14

This report serves as a user's manual for the Electromagnetic Surface Patch (ESP) Code. This code is a method of moments solution for interconnections of thin wires and polygonal plates. The code can compute currents, input impedance, efficiency, mutual coupling, and far-zone radiation and scattering patterns. In addition to describing the code input and output, the use of the code is illustrated by simple examples. Subroutine descriptions are also given. Author (GRA)

N84-18498# Army Engineer Topographic Labs., Fort Belvoir, Va.
MAPPING APPLICATIONS OF VIDEO DISC TECHNOLOGY
D. J. Costanzo 26 Jun. 1983 11 p Presented at the Defense Computer Graphics Conf., Chicago, 26-30 Jun. 1983
(AD-A135842; ETL-R048) Avail: NTIS HC A02/MF A01 CSCL 17/2

Video discs can store large quantities of analog map products in a compact, nonvolatile format. Interfacing them to microcomputers provides a portable, rugged means of accessing cartographic information. This new technology has many potential applications in map data storage, navigation, training, and decision making. The U.S. Army Engineer Topographic Laboratories (USAETL) is studying hardware, software, and map design aspects of video discs with a prototype Map Video Processing (MVP) system.
Author (GRA)

N84-18499# Naval Weapons Center, China Lake, Calif.
POLARIZATION DIVERSITY COMBINING FOR REDUCTION OF ANGULAR SCINTILLATION: PROBABILITY DENSITY FUNCTION FOR A TWO-POINT-SCATTERER TARGET Interim Report
R. J. Dinger Jul. 1983 19 p
(R02100000)
(AD-A135859; NWC-TP-6434) Avail: NTIS HC A02/MF A01 CSCL 17/9

The probability density function (PDF) for linear glint has been calculated for the situation in which the tracking angles derived from the co- and cross-polarized echoes are combined to produce an averaged tracking angle. A target consisting of two scattering centers, each producing an echo signal with a Rayleigh distribution, was assumed, and two methods of combining the tracking angles were investigated. The PDFs were generated using a Monte Carlo simulation. The results show that combining the two tracking angles in this manner can reduce the fraction of the glint PDF falling outside the bounds of the target from 0.26 (the fraction when either echo is used by itself) to 0.11, if the co- and cross-polarized echoes are not correlated. If the echoes are correlated, the improvement varies linearly with the correlation coefficient between these two values. Combining weighting of the derived tracking angle by the radar cross section in each echo produces a better improvement than simple averaging of the angles.
Author (GRA)

N84-18500# Ohio State Univ., Columbus. Electroscience Lab.
TRANSIENT CURRENT DENSITY WAVEFORMS ON A PERFECTLY CONDUCTING SPHERE
E. M. Kennaugh and D. L. Moffatt Jan. 1983 38 p
(Contract N00014-78-C-0049)
(AD-A135862; ESL-710816-13) Avail: NTIS HC A03/MF A01 CSCL 20/14

The time-dependent surface current density waveforms at various points on the surface of a perfectly conducting sphere illuminated by a plane electromagnetic wave are presented. The incident plane wave has an impulsive or shock-type time dependence. Current density waveforms in the E-plane (strong creeping wave) and H-plane on both the lit and shadowed sides of the sphere are shown. On the illuminated side of the sphere, removal of the Kirchhoff or physical optics approximation for the surface current density permits a detailed examination of the deficiencies of this approximation for short times (high frequencies). From these results the form of a first order correction to the Kirchhoff current is suggested. On the shadowed side of the sphere, the changing character of the current waveform is noted. Author (GRA)

N84-18501# Command Control Communications Countermeasures Joint Test Force, Kirtland AFB, N. Mex.
PROGRAM APPROACH DOCUMENT
Jul. 1983 39 p
(AD-A135886; JTF-83-1) Avail: NTIS HC A03/MF A01 CSCL 17/4

The Command, Control, Communications Countermeasures (C3CM) Joint Test Force (JTF) was established to plan for, conduct, and report the results of Joint Test and Evaluation (JT&E) activities directed toward the following mission: to provide information which can be applied by combat commanders in the field so that they may improve the effectiveness of their forces by disrupting the enemy's command, control and communication system. This document describes the Program Approach proposed to fulfill the requirements of the C3CM JTF mission. This document represents the current JTF view on a feasible test program and serves as the framework within which changes can be accommodated and from which a Program Design Plan can be developed.
GRA

N84-18502# Naval Ocean Systems Center, San Diego, Calif.
PROPAGATION OF ELF (EXTREMELY LOW FREQUENCIES) WAVES IN THE SPHERICAL EARTH-IONOSPHERE WAVEGUIDE WITH TRANSVERSE AND LONGITUDINAL VARIATION OF PROPERTIES Report, 1979 - 1983

C. H. Shellman 14 Jun. 1983 197 p
(DNA Proj. 99-QAXH)
(AD-A135890; NOSC/TD-607) Avail: NTIS HC A09/MF A01 CSCL 20/14

A formulation is described for finding the vertical E-field in the spherical Earth-ionosphere waveguide at extremely low frequencies (ELF). A very general model of propagation parameters is allowed since values of the eigenangles and of the excitation factors are specified at elements of a mesh point array that may extend throughout the lateral extent of the spherical-shell guide the solution is based on the condition that the vertical E-field must satisfy the two dimensional wave equation in the vicinity of each mesh point. Eigensolutions are found for ranges from the transmitter for which there is no transverse variation of properties, and these are combined with the more general solution which applies to the region of transverse inhomogeneity. Two examples are given to illustrate both a symmetrical and nonsymmetrical case. It is expected that use of the formulation will make it possible to describe the effects of inhomogeneities such as the auroral zone, land-sea boundaries, the day-night terminator and man-made disturbances to the ionosphere on the amplitude and phase of the vertical E-field. Author (GRA)

N84-18503# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
ACCURACY AND SPEED OF RESPONSE TO DIFFERENT VOICE TYPES IN A COCKPIT VOICE WARNING SYSTEM M.S. Thesis
J. Freedman and W. A. Rumbaugh Sep. 1983 180 p
(AD-A135595; AFIT-LSSR-89-83) Avail: NTIS HC A09/MF A01 CSCL 17/2

Voice warning systems (VWS) in aircraft cockpits provide a valuable means of warning identification. Improvements in technology have made the VWS a viable addition to aircraft warning systems. This thesis was an experiment to determine the best voice type (male, female, or neutral machine) for use in a VWS for military aircraft. Different levels of engine background noise, signal to noise ratio of the warning message, and precursor delivery formats were used. The experiment had ten subjects performing a primary tracking task; at random intervals a voice warning was interjected, requiring that the subjects respond by pushing the correct button. The results of this experiment contradict some previous beliefs and findings. The male voice was associated with more accurate responses for voice warning systems in the military aircraft environment. For speed of response the results were more complicated; the male voice was generally more closely associated with faster response times for accurate responses. Author (GRA)

N84-18504# Riverside Research Inst., New York.
COMMUNICATION SYSTEM STUDIES FOR THE SUBMARINE LASER COMMUNICATIONS SYSTEM Final Technical Report, 26 Jun. 1981 - 31 Oct. 1982
Jerry Nowakowski, Marek Elbaum, and John M. MacEachin, Jr. Griffiss AFB, N.Y. RADC Jun. 1983 143 p
(Contract F30602-81-C-0239; ARPA Order 4250; AF Proj. D250)
(AD-A135661; RRI-T-2/511-3-00; RADC-TR-83-133) Avail: NTIS HC A07/MF A01 CSCL 17/2

Analytical relationships between the parameters of interest to the user and the parameters characterizing the hardware and the propagation channel were established for the Submarine Laser Communications (SLC) system for the first time. These relationships constitute a useful framework to study the effects of a channel on the system performance not only for the ground or space based laser transmitter, but for the airborne transmitter as well. In the study, the utility of this analytical framework is demonstrated by producing a quantitative characterization of the system performance for different signal processing schemes for fading and nonfading channels. The system optimization for the strategic and tactical applications is discussed explicity in terms of means for securing minimum scanning time or maximum operational depth, respectively. Author (GRA)

N84-18505# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
EMC (ELECTROMAGNETIC COMPATIBILITY) MODELING AND ANALYSIS: A PROBABILISTIC APPROACH
Abner Ephreth and Donald D. Weiner Griffiss AFB, N.Y. RADC Apr. 1983 110 p
(Contract F30602-78-C-0083; AF Proj. LD14)
(AD-A135664; RADC-TR-83-102) Avail: NTIS HC A06/MF A01 CSCL 20/14

This report provides a new and fundamental basis for EMC analysis, i.e., a probabilistic approach. The advances in high speed, high density integrated circuit (IC) technology provides the impetus for investigating new concepts in electromagnetic compatibility/electromagnetic interference (EMC/EMI). Performance criteria, acceptable performance, EMI performance curve and performance threshold are concepts related to susceptibility level in a probabilistic manner. In addition, the interaction at different levels (e.g., system, subsystem, equipment, component) are also discussed. Because large portions of systems are being replaced by complex ICs and because the electromagnetic environment and equipment susceptibility are in reality, random in nature, a probabilistic approach enables one to develop a statistical macromodel. In such an approach, detailed circuit models and functions are replaced by statistical models where probability density functions are used to evaluate probabilities and statistical averages associated with various responses at various operational levels.
Author (GRA)

N84-18506# Royal Aircraft Establishment, Farnborough (England).
METEOR SCATTER COMMUNICATION IN AN AIR-GROUND ENVIRONMENT
P. S. Cannon and G. Richardson Jul. 1983 15 p Presented at the Intern. Conf. on Antennas and Propagation, Norwich, Apr. 1983
(AD-A135669; RAE-TM-RAD-NAV-224; DRIC-BR-89306) Avail: NTIS HC A02/MF A01 CSCL 17/2

Experimental results from forward scattering of high frequency radio signals from meteor trails are described for a ground to ground link. The experimental results are compared with theoretical predictions and close agreement is demonstrated. The design of a very high frequency airborne meteor scatter system is addressed and it is shown to present significant problems, different in nature from those encountered in ground based systems. It is shown that experimental studies of aircraft electromagnetic noise are required before an optimal system can be designed. The reduction in data throughput due to Faraday rotation is also described.
Author (GRA)

N84-18507# IIT Research Inst., Chicago, Ill.
INTRASYSTEM ANALYSIS PROGRAM (IAP) CODE SUMMARIES Interim Report, Aug. 1978 - Dec. 1982
John J. Dobmeier, Andrew L. S. Drozd, and Joseph A. Surace Griffiss AFB, N.Y. RADC May 1983 70 p
(Contract F30602-78-C-0222; AF Proj. 2064)
(AD-A135673; RADC-TR-83-101) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report contains detailed descriptions and capabilities of the codes that comprise the Intrasystem Analysis Program. The four codes are: Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP), General Electromagnetic Model for the Analysis of Complex Systems (GEMACS), Nonlinear Circuit Analysis Program (NCAP), and Wire Coupling Prediction Models (WIRE). IEMCAP is used for computer-aided evaluation of electromagnetic compatibility (ECM) at all stages of an Air Force system's life cycle, applicable to aircraft, space/missile, and ground-based systems. GEMACS utilizes a Method of Moments (MOM) formalism with the Electric Field Integral Equation (EFIE) for the solution of electromagnetic radiation and scattering problems. The code employs both full matrix decomposition and Banded Matrix Iteration solution techniques and is expressly designed for large problems. NCAP is a circuit analysis code which uses the Volterra approach to solve for the transfer functions and node voltage of weakly nonlinear circuits. The Wire Programs deal with the Application of Multiconductor Transmission Line Theory to the Prediction of Cable Coupling for specific classes of problems. Author (GRA)

N84-18508# Signal Technology, Inc., Goleta, Calif.
PROCESSING TECHNIQUES FOR INTELLIGIBILITY IMPROVEMENT TO SPEECH WITH CO-CHANNEL INTERFERENCE Final Technical Report, Jun. 1981 - Aug. 1983
Brian A. Hanson and David Y. Wong Griffiss AFB, N.Y. RADC Sep. 1983 134 p
(Contract F30602-81-C-0226; AF Proj. 7055)
(AD-A135702; RADC-TR-83-225) Avail: NTIS HC A07/MF A01 CSCL 17/2

Enhancing speech that has been corrupted during transmission or recording is a widely researched problem. A special case is when the interference is a second talker's voice. This report summarizes research on processing techniques that improve the intelligibility of the desired speech signal in the presence of such voice interference. Formal subjective intelligibility test procedures for evaluating enhancement algorithms for the voice interference problem are first developed. Computational objective measures based on spectral criteria are also developed to provide testing during intermediate stages of algorithm development. GRA

N84-18509# Hazeltine Corp., Greenlawn, N. Y.
INTERACTIVE COMMUNICATION SYSTEMS SIMULATION MODEL (ICSSM) EXTENSION Final Technical Report, Jan. 1981 - Jul. 1982
Irene Gerry, Mary Mammone, and William D. Wade Griffiss AFB, N.Y. RADC Jul. 1983 173 p
(Contract F30602-81-C-0001; AF Proj. 4519)
(AD-A135704; 6479; RADC-TR-83-165) Avail: NTIS HC A08/MF A01 CSCL 17/2

The Interactive Communication System Simulation Model (ICSSM), developed for the Rome Air Development Center, is capable of simulating a point-to-point communication system including its functional elements, components, propagation effects, and transmission media. The ICSSM is a flexible, expandable, sophisticated and easy-to-use computerized means to develop or configure communication system specific simulation models; specify and validate system requirements; evaluate new techniques and assess the performance of existing and proposed conventional and ECCM communications systems and equipment. The ICSSM's preconfigured programming structure frees the analyst from the burden of constructing a special simulation framework for each model effort, thus permitting him to concentrate on the model formulation itself. Further, the analyst may benefit from the legacy of previous modeling via the ICSSM library of communication model elements which are supported by computerized tutorials and guides. The development of the initial ICSSM concentrated on efficient system structure, a generalized simulation capability and on making the system easy to use. The ICSSM increases in utility with continued use as additional modeling elements are incorporated into the expandable library. Author (GRA)

N84-18510# California State Univ., Northridge. School of Engineering and Computer Science.
A STUDY OF ATMOSPHERIC TRANSMISSION IN THE WAVELENGTH REGIONS OF 0.35 MICROMETERS TO 14 MICROMETERS Final Report, Oct. 1982 - Aug. 1983
Neil Jenkins, Casey Ko, Timothy W. Fox, Raymond Cammilleri, and Laurence Caretto Edwards AFB, Calif. AFFTC Aug. 1983 104 p
(Contract F04700-83-M-0053; AF Proj. 6320)
(AD-A135721; AFFTC-TIM-83-3) Avail: NTIS HC A06/MF A01 CSCL 20/14

This report documents a study of low altitude atmospheric radiation transmission conducted by a student-faculty team at California State University, Northridge, School of Engineering. The report was generated under a contract issued by the Air Force Flight Test Center at Edwards Air Force Base. A simple computer program, LARTAP, has been developed. The simplicity of the program makes it easy to modify to suit users requirements. Should detailed testing be required to improve program accuracy, currently available instrumentation has been evaluated. It has also been suggested that a technique involving direct measurement of radiation transmission and utilization or a numerical filtering technique may provide a more accurate model of atmospheric transmission at a test site. Author (GRA)

N84-18511# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MULTI-DIMENSIONAL SIGNAL PROCESSING RESEARCH PROGRAM Semiannual Technical Summary Report, 1 Oct. 1982 - 31 Mar. 1983
D. E. Dudgeon 31 Mar. 1983 49 p
(Contract F19628-80-C-0002; AF Proj. 4594)
(AD-A135732; ESD-TR-83-035) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Semiannual Technical Summary covers the period 1 October 1982 through 31 March 1983. It describes the significant results of the Lincoln Laboratory Multi-Dimensional Signal Processing Research Program, sponsored by the Rome Air Development Center, in the areas of multiprocessor architectures for image processing and algorithms for object detection and region classification in aerial reconnaissance imagery. Author (GRA)

N84-18512# California Univ., Berkeley. Electronics Research Lab.
THE VOCODER PROJECT Final Report, 1 Jul. 1979 - 31 Jan. 1983
R. W. Brodersen Jan. 1983 17 p
(Contract MDA903-79-C-0429; ARPA Order 3793)
(AD-A135820) Avail: NTIS HC A02/MF A01 CSCL 17/2

Since the invention of the first vocoder system a half century ago, a steady trend towards lower-cost and more compact realizations of speech analysis and synthesis systems have been evident. The vocoder we designed at UCB was a result of the desire to integrate the entire function of such a system into a single MOS/LSI circuit. At the same time, the opportunity was used to develop a more general design philosophy to facilitate the implementation of other signal-processing functions with the same technology. We created a library of standard circuit functions, the design of which reflects the direction we took in terms of system organization and processor architecture. Essential to this effort was the availability of a modest but well-thought-out collection of computer-aided design tools, and a close association between ourselves and the designers of these tools. GRA

N84-18513# Florida Univ., Gainesville. Electronic Communications Lab.
RADAR CHAFF: A BIBLIOGRAPHY
P. Z. Peebles, Jr. Nov. 1983 56 p
(Contract DAAK21-82-C-0107; DA Proj. 1L6-62616-AH-77)
(AD-A135928; HDL-CR-83-107-5) Avail: NTIS HC A04/MF A01 CSCL 17/4

A search has been conducted to find unclassified literature citations related to the electromagnetic wave scattering properties of radar chaff. Over 155 specific citations (not including books) were found and compiled chronologically, with abstracts, in a main bibliography. They were also separately listed into 1 or more of 10 specific categories according to content. Author (GRA)

N84-18514# Naval Aerospace Medical Research Lab., Pensacola, Fla.
INTERACTIVE VOICE TECHNOLOGY: VARIATIONS IN THE VOCAL UTTERANCES OF SPEAKERS PERFORMING A STRESS-INDUCING TASK
J. D. Mosko, K. N. Stevens, and G. R. Griffin 16 Aug. 1983 39 p
(F58-528)
(AD-A135932; NAMRL-1300) Avail: NTIS HC A03/MF A01 CSCL 05/10

Acoustical analyses were conducted of words produced by four speakers in a motion stress-inducing situation. The aim of the analyses was to document the kinds of changes that occur in the vocal utterances of speakers who are exposed to motion stress and to comment on the implications of these results for the design and development of voice interactive systems. The speakers differed markedly in the types and magnitudes of the changes that occurred in their speech. For some speakers, the stress-

inducing experimental condition caused an increase in fundamental frequency, changes in the pattern of vocal fold vibration, shifts in vowel production and changes in the relative amplitudes of sounds containing turbulence noise. All speakers showed greater variability in the experimental condition than in more relaxed control situation. The variability was manifested in the acoustical characteristics of individual phonetic elements, particularly in speech sound variability observed serve to unstressed syllables. The kinds of changes and variability observed serve to emphasize the limitations of speech recognition systems based on template matching of patterns that are stored in the system during a training phase. There is need for a better understanding of these phonetic modifications and for developing ways of incorporating knowledge about these changes within a speech recognition system. GRA

N84-18515# University of Southern California, Marina del Rey. Information Sciences Inst.
ISSUES IN SATELLITE PACKET VIDEO COMMUNICATION
S. L. Casner, D. Cohen, and E. R. Cole Jul. 1983 16 p
(Contract MDA903-81-C-0335)
(AD-A135942; ISI/RS-83-5) Avail: NTIS HC A02/MF A01 CSCL 17/2

Recent advances in packet communication over satellite links make it now possible, for the first time, to seriously consider the application of this technology to real-time video transmission. Unfortunately, packet communication over satellite links poses several severe problems for real-time video applications: the data rate available on packet satellite links is usually below what is required for real-time video applications; this data rate is shared dynamically with many other users with unpredictable demands; the delay associated with any use of a geosynchronous satellite is very large; and the error characteristics vary as a result of many uncontrollable external factors. This paper discusses the problems, suggests several techniques to cope with them, and describes the application of these techniques in a real-time packet video communication system being implemented at ISI.
Author (GRA)

N84-18516# Naval Postgraduate School, Monterey, Calif.
ELECTROMAGNETIC NEAR-FIELD COMPUTATIONS FOR A BROADCAST MONOPOLE USING NUMERICAL ELECTROMAGNETICS CODE (NEC) M.S. Thesis
D. D. Thomson Sep. 1983 150 p
(AD-A135975) Avail: NTIS HC A07/MF A01 CSCL 12/1

An often ignored aspect of electromagnetic radiation from antennas is the characterization of their near-fields. A computer program, Numerical Electromagnetics Code, is validated for accurate near-field computations and applied to a model of a broadcast monopole. E- and H-fields are plotted as a function of position along the antenna for various distances from the surface. The fields are also plotted as a function of radical distance outward for various heights. Author (GRA)

N84-18517# Naval Postgraduate School, Monterey, Calif.
INTERPRETATION OF A SAR (SYNTHETIC APERTURE RADAR) IMAGE OF THE BAY OF BISCAY M.S. Thesis
J. F. Soubrier Sep. 1983 136 p
(AD-A135981) Avail: NTIS HC A07/MF A01 CSCL 17/9

On August 20, 1978, the Synthetic Aperture Radar (SAR) on board the satellite SEASAT, gave evidence of high energy internal oceanic activity at the shelfbreak in the northern part of the Bay of Biscay. Quantitive spatial measurements of internal wave patterns were correlated with conventional, quasi-synoptic in situ data and yielded phase speeds of 0.55M/S for high frequency, nonlinear internal waves, generated in groups at the canyons indenting the shelfbreak and at the time of low tide in Brest. Their periods were found to be of 70MIN and their amplitudes estimated to be 15M. Ocean swell refraction, observed on the SAR image, together with a localized significant increase in wave height detected by the SEASAT altimeter, was related to the shear of a northwestward geostrophic jet (ca. 0.5M/S) at the break. Possible operational consequences of these features are summarized as an assessment of a SAR's capability to give tactical as well as scientific real-time information on the internal ocean.
Author (GRA)

N84-18518# Gould, Inc., Oxnard, Calif. Measurement Systems Div.
ADVANCED STRAIN-GAGE PRESSURE TRANSDUCER Final Report, Oct. 1978 - Mar. 1983
Julian Delmonte, Harry Albaugh, Daniel S. Baker, and Charles B. Spence Wright-Patterson AFB, Ohio AFWAL Mar. 1983 84 p
(Contract F33615-78-C-2064; AF Proj. 3066)
(AD-A136063; AFWAL-TR-82-2009) Avail: NTIS HC A05/MF A01 CSCL 13/8

Gould, Inc. has developed new strain gage deposition and lead wire attachment processes that have shown significant promise for improved accuracy, higher reliability, and lower cost when applied to strain gage pressure transducers now being used in gas turbine control and diagnostic systems. This report summarizes work efforts to experimentally identify and to validate, via bench tests, the benefits of these new fabrication processes. The results of static accuracy, temperature and pressure cycling, acceleration, vibration, thermal and mechanical shock, and humidity testing are discussed. Author (GRA)

N84-18519# Boeing Co., Seattle, Wash.
EMC (ELECTROMAGNETIC COMPATIBILITY) SYSTEM TEST AND ANALYSIS INTERFACE Final Technical Report
E. F. Ball, L. Knutson, and B. L. Carlson Griffiss AFB, N.Y. RADC May 1983 101 p
(Contract F30602-80-C-0105; AF Proj. 2338)
(AD-A136064; RADC-TR-83-121) Avail: NTIS HC A06/MF A01 CSCL 20/14

One of the major problems in ensuring the electromagnetic compatibility (ECM) of a system is the efficient utilization of equipment level measurements and system level analysis tools. The contents of this report present an indepth evaluation of MIL-STD-461 and the United States Air Force's system level analysis tool, Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). Recommended changes to improve system level ECM predictions based on equipment and system level test results are presented along with recommended changes to IEMCAP. Author (GRA)

N84-18520# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PERTURBATIONS ON THE RECEPTION CHARACTERISTICS OF ANTENNAS ON DIEGO GARCIA DUE TO THE PRESENCE OF A GEODSS SITE
R. Weber 28 Oct. 1983 28 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A136107; ETS-71; ESD-TR-83-061) Avail: NTIS HC A03/MF A01 CSCL 09/5

The U.S. Navy has developed a large part of Diego Garcia into a support facility. As a consequence, many receiving antennas have been installed. The search for possible locations for a GEODSS site on the northern part of the island (the most developed part) resulted in the consideration of available areas in and near the receiving antenna field. A natural concern was the possible degradation of the reception characteristics of antennas adjacent to the GEODSS structures in each of the selected areas. This report describes in detail in the antenna field. Since the method is general, only the results are presented for two additional cases. For all cases, the conclusion is that for well-designed receiving systems, the degradation due to the GEODSS buildings would be negligible. Author (GRA)

N84-18521# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
STUDY OF FINITISTIC CHANNEL MODELS Final Scientific Report
D. L. Neuhoff and P. C. Shields (Toledo Univ.) 19 Aug. 1983 12 p
(Grant AF-AFOSR-0054-80; AF Proj. 2304)
(AD-A136139; AFOSR-83-1110TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The modeling of discrete-time stationary communication channels with memory was investigated. The approach was to develop distance measures to quantify the degree to which one channel or model approximate another and then to characterize the class of channels that can be well approximated by various types of models. A variety of channel distances were investigated. The results provide characterizations of the classes of channels approximable by finite memory models, primitive models, and finite state indecomposable models. The concept of channel entropy, which is the minimum amount of randomness needed to simulate a channel, was discovered. The results apply to both discrete and continuous alphabet channels. Author (GRA)

N84-18522# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.

THE GRAND BANKS EXPERIMENT: A SATELLITE/AIRCRAFT/SHIP EXPERIMENT TO EXPLORE THE ABILITY OF SPECIALIZED RADARS TO DEFINE OCEAN FRONTS Final Report

Paul E. LaViolette Jul. 1983 132 p
(AD-A136181; NORDA-49) Avail: NTIS HC A07/MF A01 CSCL 17/9

At various times during 1978-1979, a joint U.S.-Canadian experiment involving ships, buoys, aircraft, and satellites was conducted in the waters southeast of the Grand Banks. The purpose was to determine the ability of satellite- and aircraft-specialized radars (SAR and SLAR) to monitor ocean fronts. The experiment results, detailed in this report, show that these radars are capable of defining thermal fronts under most weather conditions. The degree, as well as type, of definition depended on the angle the wind made with the thermal front and associated currents. Winds blowing parallel to the fronts produced shear lines in the SAR and SLAR imagery. Winds blowing orthogonal to the front produced broad patterns whose changes mark the location of the thermal fronts. This latter definition however, delineation was more gradual than the sharp thermal gradients marking the fronts seen in satellite infrared imagery. The possible causes of these effects are detailed in this report. Author (GRA)

N84-18523# Naval Postgraduate School, Monterey, Calif.

AN ITERATION ALGORITHM FOR OPTIMAL NETWORK FLOWS M.S. Thesis

Chang Joon Woong Sep. 1983 85 p
(AD-A136183) Avail: NTIS HC A05/MF A01 CSCL 17/2

A packet switching network has the desirable feature of rapidly handling short (bursty) messages of the type often found in computer communication systems. In evaluating packet switching networks, the average time delay per packet is one of the most important measures of performance. The problem of message routing to minimize time delay is analyzed here using two approaches, called 'successive saturation' and 'max-slack', for various traffic requirement matrices and networks with fixed topology and link capacities. Author (GRA)

N84-18524# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

THE C-SQUARED SYSTEM: A GENERAL-PURPOSE NEURON NETWORK MODEL

Thomas C. Hartum, Vincent D. Mortimer, Jr., J. Ryland Mundie, Donald Osborne, and James C. Rock Sep. 1983 70 p
(Contracts AF 33(615)-5106; F33615-67-C-1887; F33615-69-C-1683; F-33615-70-C-1557; F33615-72-C-1483; F33615-76-C-0029; AF Proj. 7233)
(AD-A136191; AFAMRL-TR-80-84) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report describes a general-purpose neuron network model referred to as the C-squared (C2) system. The system contains 504 hardware neuron models called syncoders. As the result of an extensive effort to improve these neuron models, five versions (Mod 1 through Mod 5) exist. Regardless of the version, each syncoder circuit board contains two syncoder circuits; and the circuit cards are totally compatible at the board connector interface. The current C2 System contains some syncoders of all versions. The inputs to each syncoder are fixed bias voltages and weighted pulses from other syncoders. These biases and weights are provided by 1,728 sample-and-hold circuits which are set under control of a PDP-8S digital computer. Clearly this provides tremendous flexibility in building complex neuron networks. The ease of constructing such networks is enhanced by providing access to all of the syncoders and sample-and-holds, plus 18 general-purpose operational amplifiers, via three large, removable patch panels. This also allows one to easily change from one complex circuit to another. Discrete components (such as resistors and capacitors) can be connected to the syncoders with special patch cords, modifying the firing characteristics of the individual neuron models. In addition, controls on each syncoder circuit board allow individual neuron thresholds and time constants to be tuned. GRA

N84-18525# Georgia Inst. of Tech., Atlanta. Electromagnetic Effectiveness Div.

ANTENNA PATTERN MEASUREMENTS TO CHARACTERIZE THE OUT-OF-BAND BEHAVIOR OF REFLECTOR ANTENNAS Final Technical Report, 21 Dec. 1980 - 30 Sep. 1981

B. J. Cown, E. E. Weaver, and C. E. Ryan, Jr. Dec. 1983 106 p
(Contract F19628-80-C-0042)
(AD-A136199; ECAC-TR-83-003) Avail: NTIS HC A06/MF A01 CSCL 09/5

Research was conducted to collect and describe out-of-band antenna pattern data. The research efforts were devoted: (1) to deriving valid measured data for a reflector antenna for out-of-band frequencies spanning intervals around the second and third harmonics of the in-band design frequency, and (2) to statistically characterize the measured data. The second harmonic data were collected for both polarization senses for the out-of-band frequencies of 5.5 GHz to 7.5 GHz in steps of 0.1 GHz. The third harmonic data were collected for both polarization senses for the out-of-band frequencies of 8.0 GHz to 10.0 GHz in steps of 0.1 GHz. Additionally, in-band data were collected at 2.9, 3.0, and 3.1 GHz for both polarization senses. The measured data were collected on the Georgia Tech compact antenna range test facility with the aid of an automated data logger system designed expressly for efficient collection of broadband antenna data. The pattern data, recorded directly on magnetic disks, were analyzed: (1) to compute average gain and standard deviation over selected angular sectors, (2) to construct cumulative probability curves, and (3) to specify the peak gain and the angular coordinates of the peak at each frequency. GRA

N84-18526# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.

COMPLEX VECTOR ALGEBRA IN ELECTROMAGNETICS

Ismo V. Lindell 1981 20 p refs Submitted for publication
(Rept-S-125; ISBN-951-752-289-4) Avail: NTIS HC A02/MF A01

Vector algebra for analyzing time harmonic electromagnetic fields is summarized. One-to-one mapping between time-harmonic vectors and complex time-independent vectors is introduced. It is demonstrated that all multilinear identities that are valid for real vectors are also valid for complex vectors. Parallel and perpendicular complex vectors are defined and cross polarization is discussed. Axial decomposition and representations of the polarization of complex vector are outlined. Vector expansion in terms of a complex base is studied. Author (ESA)

N84-18527# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.

ELEMENTS OF DYADIC ALGEBRA AND ITS APPLICATION IN ELECTROMAGNETICS

Ismo V. Lindell 1981 82 p refs
(Rept-S-126; ISBN-951-752-332-7) Avail: NTIS HC A05/MF A01

Dyadic formalism is reviewed and powerful identities, greatly reinforcing the formalism, are introduced. Examples from electromagnetics are studied by applying dyadic algebra, including wave propagation problems in different media, polarization dyadic, surface impedance dyadic and affine transformation of the electromagnetic fields. Author (ESA)

N84-18528# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
DIELECTRICALLY LOADED CORRUGATED WAVEGUIDE: VARIATIONAL ANALYSIS OF A NONSTANDARD EIGENPROBLEM
Ismo V. Lindell and Ari H. Sihvola 1982 20 p refs
(Rept-S-131; ISBN-951-752-627-X) Avail: NTIS HC A02/MF A01

The dielectrically loaded corrugated waveguide is analyzed using the theory of nonstandard eigenvalues and variational principles. The eigenvalue parameter is the boundary susceptance of the corrugated surface, which leads to a simple functional. The functional is tested for an air-filled corrugated guide and good accuracy for simple test functions is observed. Dispersion relation for the loaded corrugated guide is calculated together with the field pattern for quasi-balanced operation and estimates for the dielectric loss. The method is applicable in other waveguide problems where inhomogeneous material is involved.Author (ESA)

N84-18529# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
APPLICATION OF NOISE WAVES AND SCATTERING/SCATTERING-TRANSFER MATRICES FOR NOISE ANALYSIS OF MICROWAVE MIXERS
G. V. Petrov (Moscow Engineering Physics Inst.) and A. V. Raeisaenen 1982 9 p refs
(Rept-S-137; ISBN-951-752-764-0) Avail: NTIS HC A02/MF A01

The use of noise waves together with the scattering or scattering transfer matrix is proposed for noise analysis of microwave mixers. Noise figure formulas are derived using scattering and noise parameters. These formulas are readily programmable and allow the influence of terminations of different ports on noise properties of the mixer to be analyzed.
Author (ESA)

N84-18530# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 5650-5925 MHz
William B. Grant, John C. Carroll, and Charles J. Chilton Jan. 1983 99 p refs
(PB84-127430; NTIA/REPORT-83-115) Avail: NTIS HC A05/MF A01 CSCL 17B

A spectrum resource assessment of the 5650-5925 MHz band was made. Included is information on rules and regulations, allocations, technical standards, frequency assignments, system characteristics, and applicable compability analysis. Problems of concern to the U.S. Government usage of the band are identified, analyzed and recommendations made. Major issues concerned the introduction of a Fixed-Satellite Service (FSS) in the band and current usage of that portion of the band designated for industrial, scientific and medical purposes. It is concluded that power limitations for radars should be considered as an option to minimize potential interference problems with satellites which may become operational in the 5850-5925 MHz portion of the band. It is also concluded that in-band radiation limits be considered for the industrial, scientific and medical designed frequency at 5800 plus or minus MHz to help protect Government investment and future Fixed-Satellite Service usage. GRA

N84-18531# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
METHOD FOR COUNTING ERRORS, DELETIONS, AND ADDITIONS WHEN BOTH TRANSMITTED AND RECEIVED DATA ARE KNOWN
W. J. Hartman Sep. 1983 32 p refs
(PB84-127620; NTIA/REPORT-83-133) Avail: NTIS HC A03/MF A01 CSCL 17B

The problem of counting the occurrence of bit errors, block errors, bit additions or deletions and block addition or deletions is considered. A general method is developed for counting such occurrences for cases when the occurrences are not excessive. The definition of excessive varies with the amount of correlation in the transmitted data. Modifications of the general method are given for various cases of blocked data, with or without accompanying block identification, and for the special case when the transmitted data can be selected. GRA

N84-18532# National Telecommunications and Information Administration, Annapolis, Md.
ASSESSMENT OF SATELLITE POWER FLUX-DENSITY LIMITS IN THE 2025-2300 MHz FREQUENCY RANGE, PART 1
Andrew Farrar Oct. 1983 67 p refs
(PB84-129402; NTIA/REPORT-83-135) Avail: NTIS HC A04/MF A01 CSCL 17B

An assessment of the line-of-sight (LOS) power flux-density (pfd) limits for satellites operating in the 2025-2300 MHz frequency range was conducted. Two computer models were used in the analysis. Modifications to these models were suggested in order to enhance their accuracy in the evaluation of the pfd limits in this and other shared bands. Distinctions were made between the satellites in geostationary satellite orbit and those in non-geostationary orbits. Two different sets of limits were calculated, one for the satellites in the geostationary satellite orbit and the other for the satellites in nongeostationary satellite orbits. These limits were calculated using the technical characteristics of equipment in the 2025-2300 MHz frequency range. The preliminary calculations using the existing computer models indicate that the pfd limits for the satellites operating in this frequency range may be relaxed. GRA

N84-18260# Joint Publications Research Service, Arlington, Va.
COMMENT ON DIRECT TELEVISION BROADCAST BY SATELLITE
A. Terekhov *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 90-91 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 4, Apr. 1983 p 44-45 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

N84-18801# Meteorological Satellite Center, Tokyo (Japan).
RAPID FADING OF THE SIGNAL LEVEL ON 2 GHz MICROWAVE COMMUNICATION LINK BETWEEN CDAS AND MSC
Hiroaki Ohta *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 67-78 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

N84-19140# California Univ., Berkeley. Electronics Research Lab.
A THOUSAND-WORD SPEECH-RECOGNITION SYSTEM USING SPECIAL-PURPOSE MOS-LSI
Hy Murveit, Meni Lowy, and Bob Brodersen *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 13-18 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 17/2

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-18533 Overseas Relations Branch Translation Service, London (England).
RESEARCH INTO THE ELECTRODEPOSITION OF ANTIMONY
R. Piontelli and G. Tremolada 7 Nov. 1983 42 p refs Transl. into ENGLISH from La Met. Ital. (Italy), v. 32, Oct. 1980 p 417-432
(BLL-OA-Trans-3112-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

A survey of studies on the electrodeposition of antimony for refining and extracting it from ores and different types of waste products is given. The results of experiments using chloridic, tartaric and sulpho-tartaric, fluoridic and sulpho-fluoridic solutions are illustrated and discussed. Experiments on the lixivation of S62S3, with Na2S solutions and on deposition from the solutions obtained in this way in diaphragm cells, with anolytes constituted of NaOH and Na2CO3 are also discussed. The feasibility of applying the different processes is explained. S.L.

N84-18534 Overseas Relations Branch Translation Service, London (England).
EXTRA LOSSES IN THE INDUCTOR WINDINGS OF INDUCTION HEATERS AND ELECTRIC MACHINES
J. Rada 7 Nov. 1983 13 p Transl. into ENGLISH of conf. paper 4-Bb3 presented at the UIE 9th Congr., 1980 11 p Congr. held in Cannes, France, 20-24 Oct. 1980
(BLL-OA-Trans-3114-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

The general principle and significance of extra losses and resistances in the inductor windings of induction heaters and electric machines using alternating current, especially at higher frequencies (harmonics) are discussed. The relations derived for the calculation of extra losses and extra resistances are considered. S.L.

N84-18535*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTROMAGNETIC LEVITATION COIL FABRICATION TECHNIQUE FOR MSFC CONTAINERLESS PROCESSING FACILITIES
E. C. Ethridge, J. Theiss, P. A. Curreri, and G. J. Abbaschian (Florida Univ.) Nov. 1983 20 p refs
(NASA-TM-82565; NAS 1.15:82565) Avail: NTIS HC A02/MF A01 CSCL 09C

A technique is described for more reproducible fabrication of electromagnetic levitation coils. A split mandrel was developed upon which the coil is wound. After fabrication the mandrel can be disassembled to remove it from the coil. Previously, a full day was required to fabricate a levitation coil and the success rate for a functional coil was only 50 percent. About eight coils may be completed in one day using the technique developed and 95 percent of them are good levitation coils. A.R.H.

N84-18536*# Westinghouse Research and Development Center, Pittsburgh, Pa.
DOUBLE-INJECTION, DEEP-IMPURITY SWITCH DEVELOPMENT Final Report, 23 Dec. 1982 - 23 Oct. 1983
F. A. Selim and D. W. Whitson 3 Nov. 1983 39 p refs
(Contract NAS3-22247)
(NASA-CR-168335; NAS 1.26:168335; Rept-83-9F5-DISQR-R1) Avail: NTIS HC A03/MF A01 CSCL 09A

The overall objective of this program is the development of device design and process techniques for the fabrication of a double-injection, deep-impurity (DI)(2) silicon switch that operates in the 1-10 kV range with conduction current of 10 and 1A, respectively. Other major specifications include a holding voltage of 0 to 5 volts at 1 A anode current, 10 microsecond switching time, and power dissipation of 50 W at 75 C. This report describes work that shows how the results obtained at the University of Cincinnati under NASA Grant NSG-3022 have been applied to larger area and higher voltage devices. The investigations include theoretical, analytical, and experimental studies of device design and processing. Methods to introduce deep levels, such as Au diffusion and electron irradiation, have been carried out to 'pin down' the Fermi level and control device-switching characteristics. Different anode, cathode, and gate configurations are presented. Techniques to control the surface electric field of planar structures used for (DI)(2) switches are examined. Various sections of this report describe the device design, wafer-processing techniques, and various measurements which include ac and dc characteristics, 4-point probe, and spreading resistance. Author

N84-18537*# Pennsylvania Univ., Philadelphia. School of Electrical Engineering.
DEEP DIODE ARRAYS FOR X-RAY DETECTION Final Report
Jay N. Zemel 29 Jan. 1984 88 p refs
(Contract NAS5-27285)
(NASA-CR-175178; NAS 1.26:175178) Avail: NTIS HC A05/MF A01 CSCL 09C

Temperature gradient zone melting process was used to form p-n junctions in bulk of high purity silicon wafers. These diodes were patterned to form arrays for X-ray spectrometers. The whole fabrication processes for these X-ray detectors are reviewed in detail. The p-n junctions were evaluated by (1) the dark diode I-V measurements, (2) the diode C sub I - V measurements, and (3) the MOS C-V measurements. The results showed that these junctions were linearly graded in charge distribution with low reverse bias leakage current flowing through them (few nA at -10 volts). The X-ray detection experiments showed that an FWHM of 500 eV was obtained from these diodes with a small bias of just -5 volts (for X-ray source Fe55). A theoretical model was proposed to explain the extra peaks found in the energy spectra and a very interesting point - cross talk effect was pointed out. This might be a solution to the problem of making really high resolution X-ray spectrometers. Author

N84-18538# Polytechnic Inst. of New York, Brooklyn. Microwave Research Inst.
BASIC RESEARCH IN ELECTRONICS (JSEP) JOINT SERVICES ELECTRONICS PROGRAM Annual Report, 1 Apr. 1982 - 31 Mar. 1983
A. A. Oliner 30 Sep. 1983 255 p
(Contract F49620-82-C-0084)
(AD-A136290; POLY-MRI-1432-83; AFOSR-83-1132TR) Avail: NTIS HC A12/MF A01 CSCL 09/5

Investigations in electromagnetics, solid state electronics, and information electronics are summarized. Topics cover: physical effects involving open dielectric structures; wave interactions and absorption resonances on open lossy structures; nonuniform open dielectric waveguides: transitions and tapers; collective formulation of wave phenomena for guiding and transmission; high power microwave-atmosphere interactions; enhancement of inelastic optical processes on small and ultra-small solid structures; surface structural properties of metals and conduction-electron surface scattering; X-ray coupled wave interactions at crystal surfaces; single-layer and multilayer thin films, their fabrication processes and their electronic, acoustic, and optical properties; adaptive filtering and spectral estimation; and robust methods in pattern recognition, image processing, and classification and estimation problems. A.R.H.

N84-18539# California Univ., Santa Barbara. Dept. of Electrical and Computer Engineering.
DEVELOPMENT OF A PLANAR HETEROJUNCTION BIPOLAR TRANSISTOR FOR VERY HIGH SPEED LOGIC Annual Technical Report, 1 Oct. 1982 - 30 Sep. 1983
Stephen I. Long 1 Dec. 1983 21 p
(Grant AF-AFOSR-0344-82; AF Proj. 2305)
(AD-A136341; AFOSR-83-1214TR) Avail: NTIS HC A02/MF A01 CSCL 09/1

The objective of this project was to fabricate multiple heterostructure bipolar transistors in semi-insulating GaAs substrates. During the first year of effort, molecular beam epitaxial growth of doped aluminum-gallium arsenide (AlGaAs) gallium arsenide (GaAs) heterojunctions was carried out. GaAs layers were doped n-type with silicon from the background (1E16) up to 2E18 and p-type with beryllium up to 1E19. N-type AlGaAs was grown up to 30% aluminum composition and doped with silicon to 1.5E18. Tools were developed for lateral structuring of transistors such as beryllium ion implantation, reactive sputtering and thermal annealing. Single devices were grown, fabricated by mesa etching and tested. Current-voltage characteristics shows evidence of excess recombination current. Author (GRA)

N84-18540# Naval Postgraduate School, Monterey, Calif.
VLSI (VERY LARGE SCALE INTEGRATED) DESIGN OF A 16 BIT VERY FAST PIPELINED CARRY LOOK AHEAD ADDER M.S. Thesis
Joseph Robert Conradi and Bruce Robert Hauenstein Sep. 1983 213 p
(AD-A136356) Avail: NTIS HC A10/MF A01 CSCL 09/5

This thesis is an introduction to the use of computer-aided design (CAD) tools for the design of very large scale integrated circuits (VLSI). The techniques are described and a tutorial is given which illustrates their use in the computing environment at the Naval Postgraduate School. The CAD tools were applied to design a 16-bit fast pipelined adder. Author (GRA)

N84-18541# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MEASURING ACCURATELY SINGLE-PHASE SINUSOIDAL AND NON-SINUSOIDAL POWER M.S. Thesis
G. C. Laventure, Jr. 1983 185 p
(AD-A136408; AD-E000556; AFIT/CI/NR-83-78T) Avail: NTIS HC A09/MF A01 CSCL 14/2

The resulting effect of a significant increase in non-sinusoidal signals on power systems and equipment due to the application of new power electronic devices is a question yet to be answered. A subquestion in trying to determine the effects of non-sinusoidal signals on power systems and equipment is how to accurately measure these signals. This thesis makes an attempt to answer not only the question of how to measure accurately single-phase sinusoidal and non-sinusoidal power but also the question of which types of power and energy meters are most accurate and are less affected by these non-sinusoidal power variations. This thesis compares the accuracy of various power measurements using two General Electric Type P-3 Electrodynamometer wattmeters, two Clarke-Hess Model 255 Digital Wattmeters and one General Electric Type VM-63-S Induction Watthour Meter. The experimental setup used to test the accuracy of the power and energy meters consisted of using a standard 120 V, 60 Hz single-phase source which feeds the power and energy meters. The power and energy meters were connected to the specific test source (either ac, half-wave rectified, or bidirectional thyristor-controlled) which was connected to the test load (high power-factor load, R-L load, or R-C load). GRA

N84-18542# Stanford Univ., Calif. Dept. of Computer Science.
RESEARCH IN VLSI (VERY LARGE SCALE INTEGRATION) SYSTEMS Final Report, Mar. 1981 - Jun. 1983
J. Hennessy and T. Kailath Dec. 1983 33 p
(Contract MDA903-79-C-0680; DARPA Order 3773)
(AD-A136413) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report summarizes progress in the DARPA funded VLSI Systems Research Projects from March 1981 to June 1983, inclusive. The major areas under investigation have included: analysis and synthesis design aids, applications of VLSI, special purpose chip design, VLSI computers architectures, signal processing algorithms and architectures, reliability studies, hardware specification and verification, and VLSI theory. The major research problems are introduced and progress is discussed. Author (GRA)

N84-18543# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE POSSIBILITIES OF APPLICATION OF SUPER-CONDUCTORS IN ELECTRONICS
Y. Y. Kazovskiy and V. P. Kartsev 5 Dec. 1983 27 p Transl. into ENGLISH from Elektron. (USSR), no. 1, 1964 p 22-26
(AD-A136488; FTD-ID(RS)T-1323-83) Avail: NTIS HC A03/MF A01 CSCL 09/5

Investigations of the properties of frozen mercury near absolute zero revealed its electrical resistance drops to an unmeasurable value. Other metals, alloys, and compounds possess a similiar property. The electrical resistance of superconducting compounds is so low in comparison with the resistance of metals ordinarily used as conductors that the latter are used as electrical insulation coatings for superconducting conductors. B.G.

N84-18544# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF PULSE CURRENT ON THE ELECTRICAL STRENGTH OF HIGH-VOLTAGE MODULATOR TUBES
L. A. Varakin, Y. I. Yesikov, and P. V. Poshekhonov 7 Dec. 1983 15 p Transl. into ENGLISH from Radiotekhn. (USSR), no. 9, 1969 p 139-144
(AD-A136489; FTD-ID(RS)T-1338-83) Avail: NTIS HC A02/MF A01 CSCL 09/5

In the operation of a pulse high-voltage electron tube with an oxide cathode, its electrical strength considerably depends on processes which occur in it after the bombardment of the anode surface by electrons of current of the operating pulse. Several microseconds after passage of the pulse, the tube remains in a state of sharply reduced electrical strength. The strength of the tube is lowered with an increase in the pulse duration to a considerably greater degree than with corresponding increase in the train frequency. The electron bombardment of the anode is connected with the formation of positive ions, which are determined in the subsequent development of the breakdown. Author

N84-18545# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DESIGN AND MANUFACTURING TECHNOLOGY OF RADIO-ELECTRONIC EQUIPMENT, CHAPTER 5
N. F. Vollerner 5 Dec. 1983 84 p Transl. into ENGLISH from the book "Konstruirovaniye i Tekhnologiya Izgotovleniya Radio-Elektronnoy Apparatury" Kiev, Publ. House Visch Shkola, 1970 p 76-108
(AD-A136509; FTD-ID(RS)T-1248-83) Avail: NTIS HC A05/MF A01 CSCL 14/4

Radio and electronic equipment malfunctions as a result of internal and external effects. Reliability of the systems is crucial. The following topics were discussed: guarantee of reliability, economy, calculation of efficiency according to random failures, failure elements, sudden wear, and deterioration failures. B.G.

N84-18546# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
PRINCETON VLSI PROJECT Semiannual Report for period ending 1 Nov. 1982
Richard J. Lipton 1982 55 p
(Contract N00014-82-K-0549)
(AD-A136551) Avail: NTIS HC A04/MF A01 CSCL 09/5

There are three major aspects to our project: ALI, Census, and Testing. ALI, our procedural language for VLSI design and layout, is now up and running. It has already been used by Dobkin and Drysdale to redesign a divider they previously designed on a graphics system at Xerox. In addition, LaPaugh's VLSI class has already used ALI for their VLSI projects. Dobkin is currently beginning to explore ways to create graphics interfaces to the ALI system. The ALI2, the second version of our layout system is coming along well. The census language is a new way to express parallel algorithms that use a fairly loosely coupled method of control. Work is under way to understand the limits and powers of such languages. North is beginning to identify those problem areas that can be successfully mapped onto the census language. We are also thinking about implementations of census, but no implementations is yet started. Our work on testing divides into two areas. Arden is beginning to work on first silicon testing especially with respect to scanning electron microscopes (SEM). In the future we expect that we will be able to use a SEM that the Princeton Siemens group is about to get. LaPaugh and Lipton have begun to work in the area of production testing. They have already successfully been able to completely characterize the testability of prefix computations. Prefix computations arise naturally in a number of places; for instance, in carry look ahead adders. Such characterizations link the self test of these computations with classic semigroup theory. GRA

N84-18547# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
PRINCETON VLSI PROJECT Semiannual Report for period

ending 15 Apr. 1983
Richard J. Lipton 1983 78 p
(Contract N00014-82-K-0549)
(AD-A136552) Avail: NTIS HC A05/MF A01 CSCL 09/5

There are three major aspects to our project. The first concerns the development of ALI2 which is a procedural language approach to the layout of VLSI circuits. The second is the continuing investigation of the census language. Finally, the third is in the area of testing of VLSI circuits. GRA

N84-18548# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
PRINCETON VLSI PROJECT Semiannual Report for period ending 15 Nov. 1983
Richard J. Lipton 1983 98 p
(Contract N00014-82-K-0549)
(AD-A136553) Avail: NTIS HC A05/MF A01 CSCL 09/5

There are three major aspects to our project. The first concerns the development of a procedural approach to the layout of VLSI circuits. The second is the continuing investigation of the census language. Finally, the third is in the area of VLSI circuits. GRA

N84-18549# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
ELECTRIC FIELD DISTORTION IN ELECTRO-OPTICAL DEVICES SUBJECTED TO IONIZING RADIATION
Lee Aukerman 26 Dec. 1983 17 p
(Contract F04701-83-C-0084)
(AD-A136573; TR-0084(4753-06)-1; SD-TR-83-97) Avail: NTIS HC A02/MF A01 CSCL 20/6

Insulators exposed to the combined effects of an intense electric field and ionizing radiation frequently exhibit trapped-charge effects, the most notable example being the oxide in MOSFET devices. This report explores a heretofore neglected radiation damage mechanism in electrooptically tunable filters (EOTF) and other electro-optical devices requiring field strengths. This mechanism is the gross perturbation of the electric field as a result of trapped space charge. We set up the equations for calculating the changes in electric field under irradiation for two different models: (1) for blocking contacts with negligible trapping in the bulk, and (2) for ohmic contacts with bulk trapping. The results are expressed in terms of physical parameters, some of which are not known for AgGaS2, the material most likely to be used for the infrared EOTF. More experimental work is needed in order to make accurate predictions, but by estimating reasonable values for the unknown physical parameters, using SiO2, as a guideline, we find that for either model a dose of about 100,000 rad is consistent with a field degradation of 50%. From the uncertainty in physical parameters, the effect described could equally well occur at both higher and lower dosages. GRA

N84-18550# IBM Federal Systems Div., Manassas, Va.
LSI (LARGE SCALE INTEGRATED) DESIGN FOR TESTABILITY: DESIGN, DEMONSTRATION AND TESTABILITY ANALYSIS Final Report, 5 Jul. 1979 - 15 Dec. 1980
R. D. Groves and R. L. Schoenike Wright-Patterson AFB, Ohio AFWAL Nov. 1983 301 p
(Contract F33615-79-C-1729)
(AD-A135899; AFWAL-TR-81-1068) Avail: NTIS HC A14/MF A01 CSCL 05/1

The objective of this effort was to demonstrate IBM Level Sensitive Scan Design methodology as an approach for improving the testability of military LSI/VLSI circuits. LSSD was demonstrated in an LSI component AP101C test bed to be a viable and attractive design approach for military LSI/VLSI components. Author (GRA)

N84-18551# Naval Postgraduate School, Monterey, Calif.
ANALYSIS AND TESTING OF THE THERMAL DESIGN OF THE ELECTRONIC PACKAGE IN THE US ARMY'S UPGRADED LOGIC MODULE (ULM) M.S. Thesis
H. C. Keebler, III Sep. 1983 112 p
(AD-A135998) Avail: NTIS HC A06/MF A01 CSCL 09/2

The U.S. Army has developed an Upgraded Logic Module (ULM) for use in its Infantry Direct Fire Simulator System (IDFSS). It is designed to analyze data collected from associated instrumentation according to prescribed programming, to report results back to the system control via a telemetry interface, and it can be backpack mounted. The thermal environment existing at Ft. Hunter Liggett, Ca. (the primary operating environment for the ULM) during the summer will add an abnormal thermal load to the ULM operating environment in the backpack. A mock-up of the actual ULM was built to model the heat dissipation of all the components and tested in different environments using extreme power consumption rates. The actual ULM was tested with typical power consumption rates and various environmental temperatures, including solar loading. Under typical operating conditions, the ULM will remain within manufacturer's tolerances for individual component temperatures. However, slight increases in power consumption rates will severely stress the reliability limits of certain components, and the reliability of the entire system cannot be predicted.
Author (GRA)

N84-18552# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEVELOPED ELECTROTECHNOLOGY DURING A COSMIC FROST
A. Witwicki 8 Nov. 1983 21 p Transl. into ENGLISH from Horyzonty Tech. (Poland), no. 8, 1974 p 11-13, 22
(AD-A135575; FTD-ID(RS)T-1088-83) Avail: NTIS HC A02/MF A01 CSCL 09/1

The nature and advantages of cryogenics are discussed as well as various superconductor materials. The design and properties of conductors, cables, insulation, transformers and other components of electric cryogenic machines are considered. Particular emphasis is given to the development of cryogenic unipolar direct current machines and machines with induction superconducting insulation. Progress in the development of cryogenic sliding contacts and turbogenerators is reported. A.R.H.

N84-18553# University of South Florida, Tampa.
VOLTERRA TRANSFER FUNCTIONS FROM PULSE TESTS FOR MILDLY NONLINEAR CHANNELS Interim Report, Oct. 1982 - Mar. 1983
Vijay K. Jain, Aubrey M. Bush, and Daniel J. Kenneally Griffiss AFB, N.Y. RADC Jul. 1983 65 p
(Contract F30602-82-C-0135; AF Proj. 2338)
(AD-A135703; RADC-TR-83-157) Avail: NTIS HC A04/MF A01 CSCL 09/4

Multichannel communications systems are often mildly nonlinear, hence they are characterizable by the Volterra series. The methodology described herein represents a numerical implementation of an RADC in-house concept formulation for pulse testing linear and quadratic Volterra systems. This analytic formulation, in terms of the appropriate convolutions, expressed the linear and quadratic responses to square pulse input waveforms. These responses contain, in canonic form, the system poles and residues which are then determined by suitable identification methods and algorithms to provide the Volterra Transfer functions. In this paper we describe a method for determining the Volterra transfer-functions H1 (s1) and H2 (s1, s2) from pulse tests. The method involves two transient tests in the laboratory, followed by analysis by the computer. The latter consists of: (1) pole determination using the pencil-of-functions method, and (2) computation of the residues by a least-squares technique. Advantages of the method include the rapidity of the laboratory tests, as contrasted with traditional frequency-scan approaches, and the explicit determination of the transfer functions. Furthermore, the method is readily extendible to H3 (s1, s2, s3) and even to higher order transfer functions, although the computations grow very rapidly for these cases. Author (GRA)

N84-18554# Stanford Univ., Calif. Electronics Lab.
A STRUCTURED DESIGN METHODOLOGY FOR VLSI SYSTEMS Final Report, Aug. 1980 - 31 Jul. 1983
R. W. Dutton Nov. 1983 18 p
(Contract DAAG29-80-K-0046)

(AD-A135725; ARO-17200.8-EL) Avail: NTIS HC A02/MF A01 CSCL 09/5

New algorithms and tools for hierarchical design and verification of IC chips have been developed. The multi-level simulation capabilities of SABLE have been extended using the Ada language. Automatic synthesis of stick diagrams from net lists and subsequent pitch-constrained compaction of layout provide new capabilities for cell generation. New parallel algorithms for routing and design rule checking have been developed which are orders-of-magnitude faster than conventional approaches. Analytic models to accurately estimate and bound waveforms in MOS circuits have been developed and provide new insight for performance enhancement. Author (GRA)

N84-18555# Varian Associates, Palo Alto, Calif. Microwave Tube Div.

KLYSTRON MANUFACTURING TECHNOLOGY PROGRAM Final Report, Dec. 1980 - Sep. 1982

San Diego, Calif. Naval Ocean Systems Center Sep. 1983 138 p

(Contract N00123-81-C-0245)

(AD-A135782; NOSC-CR-198) Avail: NTIS HC A07/MF A01 CSCL 13/8

A number of potential manufacturing technology improvements were identified and investigated for incorporation into the klystron amplifier. Some of these were discarded because they were not feasible or did not result in sufficient reduction of cost, improved manufacturing processes or yield factor. The principal areas of effort were: (1) Investment castings, (2) Steel forgings, (3) Punch press parts, (4) Material changes, (5) Consolidation of elimination of parts and assembly operations, (6) Simplification of braze procedures, (7) Reduction of the number of brazes and machining steps between operations, (8) Use of fixturing and special tooling together with numerical control machining, (9) Reducing the skill level required to manufacture a complex device, and (10) State of the art processing such as hobbing, cold forming, and sintering. GRA

N84-18556# California Univ., Los Angeles. Dept. of Computer Science.

UCLA DEMODULATION ENGINE

Ramin Sadr Mar. 1983 114 p

(Contract MDA903-82-C-0064)

(AD-A135912; UCLA-ENG-83-23; CSD-83-1) Avail: NTIS HC A06/MF A01 CSCL 09/5

This report describes the VLSI design and implementation of a Viterbi algorithm processor for simultaneous data demodulation and phase tracking of Minimum Shift Keying signal. During the 1981-82 academic year, graduate students in the VLSI course at UCLA designed the implementation of this system as a one-year class project, and with support from ARPA (Advanced Research Project Agency of the Department of Defense), fabricated this processor on a single chip, using 4-micron NMOS technology. UCLA Demodulation Engine can be used as an inexpensive digital radio receiver in a variety of applications. Author (GRA)

N84-18557# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

MONOLITHIC ZnO SAW (SURFACE ACOUSTIC WAVES) STRUCTURES Interim Scientific Report, 1 May 1982 - 30 Apr. 1983

R. L. Gunshor and R. F. Pierret 1 Jul. 1983 62 p

(Grant AF-AFOSR-0214-81)

(AD-A135987; AFOSR-83-1172TR) Avail: NTIS HC A04/MF A01 CSCL 09/5

ZnO-on-silicon surface acoustic wave devices have been fabricated and tested. Electronic erasure of a stored correlator reference was demonstrated, the effect of laser annealing on propagation loss was examined, preliminary ageing studies were performed, and a conceptually new mode conversion resonator configuration was reported. Author (GRA)

N84-18558# Naval Postgraduate School, Monterey, Calif.

DESIGN AND ANALYSIS OF A GENERALIZED CLASS OF FIN-LINE FILTERS M.S. Thesis

K. B. Alexander and S. R. Hamel Sep. 1983 92 p

(AD-A136050) Avail: NTIS HC A05/MF A01 CSCL 09/5

This study investigates fin-line filter structures, a type of E-plane waveguide device. Expressions germane to the analysis of fin-line structures are developed. A computer aided design and analysis program based upon a mode-matching technique is described. Filters designed by this program are fabricated and tested in X-band. Good agreement with predicted response is obtained. Filters fabricated and tested in Ku and Ka bands by other researchers are analyzed by the new program. Good agreement between predicted response and published performance is noted. Author (GRA)

N84-18559# California Univ., Berkeley. Electronics Research Lab.

JOINT SERVICES ELECTRONICS PROGRAM Annual Progress Report, 1 Sep. 1982 - 31 Aug. 1983

D. J. Angelakos 30 Sep. 1983 160 p

(Contract F49620-79-C-0178; AF Proj. 2305)

(AD-A136058; UCB/ERL-83/1; AFOSR-83-1076TR) Avail: NTIS HC A08/MF A01 CSCL 09/5

An annual report of the JSEP (Joint Services Electronics Program) in Electromagnetics, Solid State Electronics, Materials and Devices, Quantum Electronics and Information Sciences is presented. In addition, results of the research to date are summarized and significant accomplishments are indicated. GRA

N84-18560# Ohio State Univ., Columbus. Electroscience Lab.

EFFECTS OF MUTUAL COUPLING ON THE PERFORMANCE OF ADAPTIVE ARRAYS Interim Technical Report

Inder J. Gupta and Aharon A. Ksienski Griffiss AFB, N.Y. RADC Jul. 1983 42 p

(Contract F30602-82-C-0009; AF Proj. 4519)

(AD-A136083; ESL-714-258-1; RADC-TR-83-164) Avail: NTIS HC A03/MF A01 CSCL 09/5

The effect of mutual coupling between array elements on the performance of adaptive arrays is examined. The study includes both steady state and transient performance. An expression for the steady state output signal-to-interference-plus-noise ratio (SINR) of adaptive arrays, taking into account the mutual coupling between the array elements, is derived. The expression is used to assess the steady state performance of adaptive arrays. The transient response is studied by computing the eigenvalues associated with the signal covariance matrix. The optimum excitation to maximize the output SINR of Applebaum type adaptive arrays in the presence of mutual coupling is also given. Author (GRA)

N84-18561# Sperry Research Center, Sudbury, Mass.

MULTIPOLE MONOLITHIC SURFACE ACOUSTIC WAVE (SAW) RESONATOR FILTERS Final Report

P. C. Meyer, W. J. Tanski, and D. Gunes Oct. 1983 90 p

(Contract N00014-81-C-2066)

(AD-A136123; SRC-CR-83-39) Avail: NTIS HC A05/MF A01 CSCL 09/5

This final report describes the work done and results achieved on a two-year effort to design and fabricate monolithic multipole Surface Acoustic Wave (SAW) resonator filters. The work and the report focus on two specific filter designs: one a six-pole Butterworth design at a center frequency of 217 MHz (Type I), the other a four-pole Chebyshev at 150 MHz (Type II). The specifications are listed. However, the design, testing, and fabrication techniques used are general and would apply equally well to similar SAW resonator filters in the 100 MHz to 800 MHz frequency range. Since more work was done, and the best results achieved on the 217 MHz Butterworth filter, it will be treated in more detail. Multipole SAW resonator technology can be divided logically into three technical areas, each with its own body of existing knwoledge: (1) multipole filter synthesis, (2) SAW resonator analysis and design, and (3) fabrication and packaging techniques.

Where feasible, the experience and techniques already developed in other technologies have been adapted for SAW multipole design and fabrication. In particular there are may similarities between bulk wave multipole filters and the SAW counterparts. In both technologies good process control and computer modeling are essential elements in providing the accuracy and precision required to achieve a multipole design. GRA

N84-18562# Michigan Univ., Ann Arbor. Electron Physics Lab.
DEVELOPMENT OF INNOVATIVE MILLIMETER-WAVE BROADBAND MIXERS Final Report, 24 Mar. 1980 - 24 Sep. 1982
J. Chen, J. R. East, G. I. Haddad, Y. Anand, and L. Mang Jan. 1983 51 p Prepared in cooperation with Microwave Associates, Inc.
(Contract N00173-80-C-0118; XF62581)
(AD-A136134; Rept-018223-F) Avail: NTIS HC A04/MF A01 CSCL 09/5

The theoretical and experimental characteristics of BARITT and TUNNETT devices for use as millimeter-wave mixers and detectors were investigated. Theoretical calculations of BARITT conversion loss, noise figure, and RF and IF impedence levels were carried out. BARITT device fabrication was studied. Three BARITT structures, useful for frequencies between 35 and 95 GHz were fabricated and tested. BARITT devices were tested as mixers and detectors at 35 and 95 GHz. BARITTs were found to be useful millimeter-wave mixers or detectors. BARITT detector performance is comparable to more conventional detectors with TSS levels of - 48 dB per 1 MHz bandwidth and a dynamic range to 1-dB compression of 40 dB. The BARITT pulse burnout performance is superior to any conventional detector with a pulsed burnout level greater than 45 W. BARITT mixer performance is also comparable to Schottky-barrier mixers with conversion losses of 5 dB and 30 MHz noise figures of 6.8 dB. This performance, coupled with the high burnout level and ease of fabrication, makes the BARITT a useful millimeter-wave device. Author (GRA)

N84-18563# Sundstrand Aviation-Rockford, Ill.
ELECTRIC REMOTELY PILOTED VEHICLE (ERPV) Final Report, Aug. 1980 - Aug. 1982
John O. Smith and Mary L. Sherman Wright-Patterson AFB, Ohio ASD Sep. 1983 156 p Prepared in cooperation with Honeywell, Inc., Horsham, PA
(Contract F33601-80-C-0339; Grant F34601-80-G-0192)
(AD-A136201; ASD-TR-83-5014) Avail: NTIS HC A08/MF A01 CSCL 10/3

Electric propulsion offers significant advantages over the present gasoline engine propulsion system on a Remotely Piloted Vehicle (RPV). The advantages are the result of technical advances in batteries, power transistors, permanent magnets and control methods. This report covers the ground and flight test of an RPV using a lithium thionyl chloride battery powering a samarium cobalt brushless dc motor. GRA

N84-18564# Los Alamos Scientific Lab., N. Mex.
FUEL CELLS FOR TRANSPORTATION APPLICATIONS Progress Report, 1 Jan. - 31 Dec. 1982
J. R. Huff Sep. 1983 52 p refs
(Contract W-7405-eng-36)
(DE84-003969; LA-9787-PR) Avail: NTIS HC A04/MF A01

The potential of fuel cell systems for use in transportation applications through basic research was investigated. The goal is to bring fuel cell technology to an established proof of concept level. In Cy 1982, research investigations included: (1) electrode kinetic studies to determine the effects of electrolytes on oxygen reduction at platinum; (2) electrode characterization using ion beam techniques; and (3) determinations of the structure, transport, and stability characteristics of solid polymer electrolytes. Electrode and fuel cell performance under simulated vehicle operating conditions are evaluated, and fuel cell system simulations to determine vehicle and testing requirements are carried out. DOE

N84-18565# Argonne National Lab., Ill. Office of Advanced Batteries Projects.
LITHIUM/IRON SULFIDE BATTERIES FOR ELECTRIC-VEHICLE PROPULSION AND OTHER APPLICATIONS Progress Report, Oct. 1981 - Sep. 1982
D. L. Barney, R. K. Steunenberg, A. A. Chilenskas, E. C. Gay, and J. E. Battles Sep. 1983 83 p refs
(Contract W-31-109-eng-38)
(DE84-004193; ANL-83-62) Avail: NTIS HC A05/MF A01

The development of lithium/iron sulfide batteries is described. The electrochemical and materials aspects of lithium alloy negative electrodes and iron sulfide positive electrodes, materials cell design, fabricated cells were examined. Alternatives to the present Li-Al and FeS electrodes which are expected to lead to higher specific energy and power investigations concerned with Li-Si, Li-Al-Si, Li-Al-Fe, are emphasized. Development work consisted of cell design improvements to increase lifetime and specific power and the fabrication of cells for testing. DOE

N84-18566# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
CYROGENIC FET IF-AMPLIFIER FOR A MM WAVE MIXER
Juhani K. Peltonen 1981 28 p refs
(Rept-S-124; ISBN-951-752-272-X) Avail: NTIS HC A03/MF A01

Design methods and results of a GaAs FET amplifier for 3 to 4 GHz band are described. A broadband, low noise amplifier used at room temperature, and also cryogenically cooled to reduce the noise temperature was developed. It has near-optimum noise performance (compared to spot noise figures quoted in literature) typically over a 1 GHZ (30 %) bandwidth. The amplifiers are designed as an IF-preamplifier for a mm-wave mixer to be used in radiometry. Author (ESA)

N84-18567# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
APPROACHING NOISE PERFORMANCE LIMITS OF SCHOTTKY-BARRIER MIXERS AT MILLIMETER WAVES
Antti V. Raeisaenen 1982 8 p refs Presented at All-Union A.S. Popov Soc. Sci. Session, Moscow, 18-20 May 1982
(Rept-S-134; ISBN-951-752-703-9) Avail: NTIS HC A02/MF A01

An ultra low-noise Schottky mixer was developed for 80 to 120 GHz. When the mixer is cooled to 20 K, its double sideband noise temperature is < 50 K over the whole frequency band. At the best operation points noise temperature is 35 to 40 K. A combination of this mixer and a cryogenic FET-amplifier at 1.4 GHz yields a receiver noise temperature of 62 K at 115 GHz. Studies were carried out with a 30:1 scale model, at 2.5 to 12 GHz: fundamental and 2nd and 3rd harmonic bands. At fundamental frequencies, whisker length and shape are found to be important. A formula for the whisker inductance was found. At second harmonic frequencies the backshort and RF-filter dominate. An equivalent circuit of the embedding impedance derived from the scale model measurement results was used with diode data to calculate the theoretical noise temperature of the mixer and the receiver. A good agreement with experiments is found.
Author (ESA)

N84-18455# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
SLIDING ELECTRIC CONTACTS IN SPACE: OBSERVATIONS ON EXISTING TECHNOLOGY AND NEW TRENDS IN LOW-SPEED APPLICATIONS
E. W. Roberts *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 3-10 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18476# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
A HIGH RESOLUTION STEPPING MOTOR
W. Auer and G. Ruff *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 193-196 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-19142# TRW Defense and Space Systems Group, Redondo Beach, Calif.
FREQUENCY DOMAIN DIGITAL FILTERING WITH VLSI
Earl E. Swartzlander, Jr. and George H. Hallnor *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 25-30 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

N84-19149# Colorado Univ., Boulder. Dept. of Electrical Engineering.
DIGITAL SIGNAL PROCESSING STRUCTURES FOR VLSI
Richard A. Roberts and Clifford T. Hullis *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 83-88 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

N84-19150# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
LINEAR OR SQUARE ARRAY FOR EIGENVALUE AND SINGULAR VALUE DECOMPOSITIONS?
Sun-Yuan Kung and R. J. Gal-Ezer *In its* Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 89-98 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/5

N84-19151# Mayo Foundation, Rochester, Minn.
SIGNAL PROCESSING IN HIGH DATA RATE ENVIRONMENTS. DESIGN TRADEOFFS IN THE EXPLOITATION OF PARALLEL ARCHITECTURES AND FAST SYSTEM CLOCK RATES. AN OVERVIEW
B. K. Gilbert, T. M. Kinter, D. J. Schwab, B. A. Naused, L. M. Krueger, K. M. Rice, and F. S. Lee (Rockwell International Microelectronics) *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 100-105 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

N84-19152# Thomson-CSF, Cagnes sur Mer (France). Div. des Activites Sous-Marines.
NEW PRINCIPLE OF ARRAY PROCESSING IN UNDERWATER PASSIVE LISTENING
G. Bienvenu and H. F. Mermoz *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 110-113 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/5

N84-19155# University of Southern California, Los Angeles. Dept. of Electrical Engineering - Systems.
IMPACT OF VLSI ON MODERN SIGNAL PROCESSING
Sun-Yuan Kung *In its* Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 123-132 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

N84-19156# Integrated Systems, Inc., Palo Alto, Calif.
A SYSTOLIC SIGNAL PROCESSOR FOR RECURSIVE FILTERING
Richard H. Travassos *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 134-138 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/3

N84-19159# University of Southern California, Marina del Rey.
THE IMPACT OF VLSI ON SIGNAL PROCESSING
Danny Cohen and Lennart Johnsson (California Inst. of Technology) *In its* Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 153-156 (For primary document see N84-19138 09-82)
(Contract MDA903-81-C-0335)
Avail: NTIS HC A11/MF A01 CSCL 09/3

N84-19164# Syracuse Univ., N. Y.
SOME CRITICAL ISSUES IN VLSI SIGNAL PROCESSOR IMPLEMENTATION
Noble R. Powell *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 185-196 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/3

N84-19166# Microelectronics Center of North Carolina, Research Triangle Park.
THE MICROELECTRONICS CENTER: A NEW FORCE IN COOPERATIVE VLSI SIGNAL PROCESSING RESEARCH Final Report
Richard B. Fair *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 202-207 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/3

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-18568 United Kingdom Atomic Energy Authority, Dounreay (Scotland).
MASS TRANSFER DURING DROP FORMATION IN THE PRESENCE OF INTERFACIAL TURBULENCE IN THE LIQUID-LIQUID SYSTEMS
Yasuo Nakaike, Takashi Mizukoshi, Takamasa Aonuma, and Teiriki Tadaki Nov. 1983 25 p refs Transl. into ENGLISH from Kagaku Kogaku Ronbunshu (Japan), v. 9, no. 2, 1983
(BLL-Dounreay-Tr-923-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

The mass transfer rate during the drop formation in the presence of interfacial turbulence was investigated. The interfacial turbulence increases the mass transfer rate. The empirical equation was obtained for the enhancement factor of the mass transfer rate which is defined as the ratio of the overall mass transfer coefficient in the presence of interfacial turbulence to the estimated value based on the penetration theory. The critical Marangoni numbers, that is the Marangoni numbers when the interfacial turbulence starts to generate, were also measured in 15 systems consisting of five solvents and three solutes. The empirical correlation was obtained of the critical Marangoni number and the product of the distribution coefficient by the ratio of diffusion coefficients of solute in two phases. S.L.

N84-18569 Overseas Relations Branch Translation Service, London (England).
THE EFFECT OF PRESSURE ON COMPLEX HEAT EXCHANGE IN A CHANNEL WITH AN ELECTRIC ARC
R. M. Kezelis, R. I. Virbaitis, A. I. Silkovas, R. A. Juskevicius, and A. B. Ambrazevicius 7 Nov. 1983 11 p refs Transl. into ENGLISH from Tr. Akad. Nauk Litovsk SSR (USSR), vol. 1, no. 116, series B, 1980 p 69-74
(BLL-OA-Trans-3090-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

Experimental research into the electrical and thermal characteristics of an electric arc heater of 30 mm internal diameter used to heat Ar to T = 10,000 K was performed with a current intensity (I) of 200-700 A, pressure (P) of (1-30) x 100,000 Pa and an Ar flow rate of (0.5-12) x .001 kg/sec. It was found that the voltage (U) at the arc is virtually independent of I, and only increases with a rise in P. The relationship between the intensity E of the electric field and P is generalized as a function with an exponent for Ar equal to 0.45, and for N2, 0.4. The total heat losses in the discharge chamber are generalized in the relationship (1) to P to the 0.5 power and to I to the 1.2 power. The average mass value

of T increases slightly with a rise in I to the 0.167 power, and decreases with a rise in the gas flow rate. S.L.

N84-18570# Academy of Sciences (USSR), Moscow. Space Research Inst.

NONLINEAR WAVES IN NONEQUILIBRIUM SYSTEMS OF THE OSCILLATORY TYPE

B. A. Malomed 1983 45 p refs

(Pr-840) Copyright. Avail: Issuing Activity

Nonlinear waves in nonequilibrium spatially uniform media with the oscillatory instability of the trivial state are considered. For the short wave system, i.e., that are with the trival state unstable against perturbations with finite wave numbers, a general one dimensional wave solution is found and its stability is investigated. Collisions of these waves in one and two dimensional cases are also considered. For the long wave dispersive systems, the hypothesis is formulated that there exists the potential which makes it possible to compare the absolute stability of different quasistationary states. S.L.

N84-18571*# Stanford Univ., Calif. Dept. of Mechanical Engineering.

EXPERIMENTAL STUDY OF FLOW REATTACHMENT IN A SINGLE-SIDED SUDDEN EXPANSION

R. V. Westphal, J. P. Johnston, and J. K. Eaton Jan. 1984 283 p refs

(Contract NAG2-42; Grant NSF CME-80-17860)

(NASA-CR-3765; NAS 1.26:3765) Avail: NTIS HC A13/MF A01 CSCL 20D

The reattachment of a fully turbulent, two dimensional, separated shear layer downstream of a single-sided sudden expansion in a planar duct flow was examined experimentally. The importance of changing the structure of the separated shear layer on the reattachment process itself was examined. For all cases, the Reynolds number based on step height was greater than 20,000, the expansion ratio was 5/3, and the inlet boundary layer was less than one-half step height in thickness. A crucially important phase was the development of a pulsed wall probe for measurement of skin friction in the reattachment region, thus providing an unambiguous definition of the reattachment length. Quantitative features of reattachment - including streamwise development of the mean and fluctuating velocity field, pressure rise, and skin friction - were found to be similar for all cases studied when scaled by the reattachment length. A definition of the reattachment zone is proposed. S.L.

N84-18572*# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.

DEVELOPING FLOW IN S-SHAPED DUCTS. 2: CIRCULAR CROSS-SECTION DUCT Final Report

A. M. K. P. Taylor, J. H. Whitelaw, and M. Yianneskis Washington NASA Feb. 1984 55 p refs

(Contract NASw-3435)

(NASA-CR-3759; E-1939; NAS 1.26:3759; FS/82/7) Avail: NTIS HC A04/MF A01 CSCL 20D

Laser-Doppler velocimetry measured the laminar and turbulent streamwise flow in a S-duct. The wall pressure distribution and one component of cross-stream velocity were also obtained for the turbulent flow case. Boundary layers near the duct inlet were about 25 percent of the hydraulic diameter in the laminar flow and varied around the periphery of the pipe between 10 percent and 20 percent in turbulent flow. Pressure-driven secondary flows develop in the first half of the S-duct and are attenuated and reversed in the second half. For both Reynolds numbers there is a region near the outer wall of the second half of the duct where the sign of the radial vorticity results in an enforcement of the secondary flow which was established in the first half of the S-duct. The core flow migrates, for both Reynolds numbers, to the outside wall of the first half and lies towards the inside wall of the second half of the S-duct at the outlet. The thinner inlet boundary layers in the turbulent flow give rise to weaker secondary motion. A.R.H.

N84-18573*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AN EXPERIMENTAL INVESTIGATION OF THE IMPINGEMENT OF A PLANAR SHOCK WAVE ON AN AXISYMMETRIC BODY AT MACH 3

A. Brosh and M. I. Kussoy Nov. 1983 164 p refs

(NASA-TM-84410; A-9490; NAS 1.15:84410) Avail: NTIS HC A08/MF A01 CSCL 20D

An experimental study of the flow caused by a planar shock wave impinging obliquely on a cylinder is presented. The complex three dimensional shock wave and boundary layer interaction occurring in practical problems, such as the shock wave impingement from the shuttle nose on an external fuel tank, and store carriage interference on a supersonic tactical aircraft were investigated. A data base for numerical computations of complex flows was also investigated. The experimental techniques included pressure measurements and oil flow patterns on the surface of the cylinder, and shadowgraphs and total and static pressure surveys on the leeward and windward planes of symmetry. The complete data is presented in tabular form. The results reveal a highly complex flow field with two separation zones, regions of high crossflow, and multiple reflected shocks and expansion fans. S.L.

N84-18574# National Aerospace Lab., Tokyo (Japan).

PNEUMATIC ATOMISATION WITH COAXIAL INJECTORS: MEASUREMENTS OF DROP SIZE BY DIFFRACTION METHOD AND LIQUID PHASE FRACTION BY ATTENUATION METHOD

Hiromi Gomi 1983 46 p refs In JAPANESE; ENGLISH summary

(NAL-TR-768; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

Experiments were made to determine the drop size distribution in sprays from twin fluid, parallel flow, concentric jet atomizers using air/water and helium/water. Bimodal distribution of diffracted light energy impeded measurements at high injected mass ratios of liquid to gas. The drop size increased with the distance from atomizers and spray axes. The drop size on spray axes had its local maximum with an injection gas velocity of 200 m/s and its minimum with an injection gas velocity of 100 m/s. Using minimum drop diameter of Dp,min = 5.8 microns gave ratios of SMD to MMD consistent with other studies. S.L.

N84-18575*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.

MODELING OF TRANSIENT HEAT PIPE OPERATION Semiannual Status Report

Gene T. Colwell and James G. Hartley Feb. 1983 11 p refs

(Grant NAG1-392)

(NASA-CR-173305; NAS 1.26:173305) Avail: NTIS HC A02/MF A01 CSCL 20D

The major goal of this project is to develop mathematical models of heat pipes which can be used to predict transient behavior under normal and adverse conditions. The models and solution techniques are to be formulated so that they can be incorporated into existing NASA structural design codes. The major parameters of interest are heat flux distribution, temperature distribution, working fluid pressure distribution, fluid and containment thermal and mechanical properties and geometry. Normal transient operation is taken to be operating conditions where the capillary structure remains fully wetted. Adverse transient operation occurs when drying, re-wetting, choking, non-continuum flow, thawing, freezing, etc., occur in the internal heat pipe working fluid. B.W.

N84-18576*# National Aeronautics and Space Administration, Washington, D. C.

SECOND ALL-UNION SEMINAR ON HYDROMECHANICS AND HEAT-MASS TRANSFER IN WEIGHTLESSNESS. ABSTRACTS OF REPORTS: TABLE OF CONTENTS

G. Z. Gershuni and Ye. M. Zhukhovitskiy Jan. 1984 15 p refs Transl. into ENGLISH of conf. papers, 1981 p 176-186 Seminar held in Perm, USSR, 1981

(Contract NASw-3542)

(NASA-TM-77534; NAS 1.15:77534) Avail: NTIS HC A02/MF A01 CSCL 20D

Abstracts of reports are given which were presented at the Second All Union Seminar on Hydromechanics and Heat-Mass Transfer in Weightlessness. Topics inlcude: (1) features of crystallization of semiconductor materials under conditions of microacceleration; (2) experimental results of crystallization of solid solutions of CDTE-HGTE under conditions of weightlessness; (3) impurities in crystals cultivated under conditions of weightlessness; and (4) a numerical investigation of the distribution of impurities during guided crystallization of a melt. B.W.

N84-18577*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.

TRANSITION TO TURBULENCE IN PLANE CHANNEL FLOWS

Sedat Biringen Feb. 1984 47 p refs

(Grant NAG1-228)

(NASA-CR-172298; NAS 1.26:172298) Avail: NTIS HC A03/MF A01 CSCL 20D

Results obtained from a numerical simulation of the final stages of transition to turbulence in plane channel flow are described. Three dimensional, incompressible Navier-Stokes equations are numerically integrated to obtain the time evolution of two and three dimensional finite amplitude disturbances. Computations are performed on CYBER-203 vector processor for a 32x51x32 grid. Results are presented for no-slip boundary conditions at the solid walls as well as for periodic suction blowing to simulate active control of transition by mass transfer. Solutions indicate that the method is capable of simulating the complex character of vorticity dynamics during the various stages of transition and final breakdown. In particular, evidence points to the formation of a lambda-shape vortex and the subsequent system of horseshoe vortices inclined to the main flow direction as the main elements of transition. Calculations involving periodic suction-blowing indicate that interference with a wave of suitable phase and amplitude reduces the disturbance growth rates. S.L.

N84-18578*# Analex Corp., Cleveland, Ohio.

ENGINEERING CORRELATIONS OF VARIABLE-PROPERTY EFFECTS ON LAMINAR FORCED CONVECTION MASS TRANSFER FOR DILUTE VAPOR SPECIES AND SMALL PARTICLES IN AIR Final Report

Sueleyman A. Goekoglu and Daniel E. Rosner (Yale Univ, New Haven, Conn.) Jan. 1984 16 p refs

(Contract NAS3-23293; Grant NAG3-201)

(NASA-CR-168322; NAS 1.26:168322) Avail: NTIS HC A02/MF A01 CSCL 20D

A simple engineering correlation scheme is developed to predict the variable property effects on dilute species laminar forced convection mass transfer applicable to all vapor molecules or Brownian diffusing small particle, covering the surface to mainstream temperature ratio of 0.25 < T sub W/T sub e < 4. The accuracy of the correlation is checked against rigorous numerical forced convection laminar boundary layer calculations of flat plate and stagnation point flows of air containing trace species of Na, NaCl, NaOH, Na2SO4, K, KCl, KOH, or K2SO4 vapor species or their clusters. For the cases reported here the correlation had an average absolute error of only 1 percent (maximum 13 percent) as compared to an average absolute error of 18 percent (maximum 54 percent) one would have made by using the constant-property results. Author

N84-18579# National Aerospace Lab., Tokyo (Japan).

NONLINEAR SLOSHING ANALYSIS OF LIQUID IN CONTAINERS WITH ARBITRARY GEOMETRIES

Keiji Komatsu 1983 21 p refs In JAPANESE; ENGLISH summary

(NAL-TR-757; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A method is presented for calculating the nonlinear dynamic behavior of liquid in containers with arbitrary geometries. The formulation is based on the numerical perturbation technique, which uses the orthogonality of the mode shapes and yields nonlinear coupled ordinary differential equations describing the temporal behavior. The linear mode shapes are obtained by numerical or analytical methods, and the equations describing the temporal behavior are solved by the classical perturbation method. Numerical examples are carried out on the sloshing in a rectangular tank and an axisymmetric tank to demonstrate the validity of the method. S.L.

N84-18580# National Aerospace Lab., Tokyo (Japan).

ON AN EXTENSION OF FREE STREAM-LINE THEORY

Yoshikazu Ogata 1983 12 p refs In JAPANESE; ENGLISH summary

(NAL-TR-772; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

An extension of the free stream-line theory of the Kirchhoff type is described. The points of extension are essentially the following two: (1) The velocity gradient at the prescribed separation point remains finite. (2) The velocity along the free stream-line is allowed to vary rather than always being held constant. As a result of the extension, the theory comes to satisfy the necessary conditions of the inviscid external flow compatible with the separated boundary layer and wake. Author

N84-18581# Naval Postgraduate School, Monterey, Calif.

EXPERIMENTAL INVESTIGATION OF TURBULENT HEAT TRANSFER IN STRAIGHT AND CURVED RECTANGULAR DUCTS M.S. Thesis

S. F. Daughety Sep. 1983 74 p

(AD-A136239) Avail: NTIS HC A04/MF A01 CSCL 20/4

An experimental investigation was conducted to examine the convective heat transfer in straight and curved ducts of rectangular cross section. The experimental configuration was modeled as infinite parallel plates with one wall at a constant temperature and the opposite wall adiabatic. The experiments were conducted at steady state for turbulent flow. Average Nusselt numbers were used to compare the heat transfer characteristics of the straight and curved sections. The development of Taylor-Gortler vortices in the curved section was shown to enhance the heat transfer rate in the curved section as compared to that of the straight section by approximately 15 to 20 %. Improved heat exchanger designs and improved cooling of turbine blades are two disciplines that could benefit from a better understanding of the effects of curvature on the rate of heat transfer. Author (GRA)

N84-18582# Naval Ship Research and Development Center, Bethesda, Md.

A CALCULATION OF THE PARABOLIZED NAVIER-STOKES EQUATIONS FOR TURBULENT AXISYMMETRIC FLOWS USING STREAMLINE COORDINATES AND K-EPSILON TURBULENCE MODEL

T. F. Hogan Nov. 1983 132 p

(SR0-2301)

(AD-A136240; DTNSRDC-83/070) Avail: NTIS HC A07/MF A01 CSCL 20/4

A numerical method for calculating turbulent axisymmetric flows at the stern and in the wake of bodies of revolution is presented. A partially parabolic marching technique in a streamline coordinate system is used together with the k-epsilon turbulence model. In the viscous sublayer region, the velocity is calculated using a mixing length argument instead of the wall function method. The numerical procedure starts at a station on the body where the boundary layer is thin and is pursued several body lengths downstream into the wake. The numerical solution is obtained by marching downstream and iteratively solving for each flow variable. The axial and normal corrections to the pressure are calculated by solving a kinematic compatibility equation for the position of the streamlines. The boundary conditions for the pressure are set by calculating the potential flow about an equivalent displacement body. The numerical marching scheme is repeated, restarting at the initial station, until convergence is achieved. Comparisons are made between the numerical results and the experimental data for four different bodies. Author (GRA)

N84-18583# McDonnell-Douglas Corp., Long Beach, Calif.

UNSTEADY BOUNDARY LAYERS ON THIN BODIES OF REVOLUTION

T. Cebeci, K. Stewartson, and S. M. Schimke Aug. 1983 38 p (Contracts F49620-82-C-0055; NSF MEA-80-18565; AF Proj. 2307)
(AD-A136257; AFOSR-83-1211TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The evolution of unsteady boundary layers on the line of symmetry of a thin prolate spheroid in uniform motion at constant angle of attack after an impulsive start is studied for a prescribed pressure distribution and results have been obtained for angles of attack ranging from 30 degrees to 50 degrees. The unsteady boundary layer is initially unseparated but develops a region of reversed flow after a finite time. A short time later, the streamwise displacement thickness develops a pronounced peak and leads to a singularity of the same type as that observed by van Dommelen and Shen on a circular cylinder started impulsively from rest. GRA

N84-18584# Lowell Univ., Mass.
REATTACHMENT OF A THREE-DIMENSIONAL, INCOMPRESSIBLE JET TO AN ADJACENT AXISYMMETRIC INCLINED SURFACE Final Report, 15 Apr. 1982 - 31 Jan. 1983
E. E. Niemi, Jr. Mar. 1983 44 p
(Grant AF-AFOSR-0215-82; AF Proj. 2307)
(AD-A136288; AFOSR-83-1225TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

A study was made of the fluid mechanics of a thrust reverser jet reattaching to an aircraft nozzle afterbody. The problem basically involves the Coanda effect flow of a three dimensional, incompressible jet to an adjacent axisymmetric, inclined surface. The equations were derived in integral form and programmed for numerical solution for the case of an exhaust flow with no opposing free stream flow. Test data are reported for a scale model of a nozzle afterbody exhausting against a target-type thrust reverser. Data are presented for surface pressure coefficient at various points along the model. GRA

N84-18585# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
THE EFFECTS OF CYLINDRICAL SURFACE MODIFICATIONS ON TURBULENT BOUNDARY LAYERS Interim Report
J. B. Johansen and C. R. Smith Apr. 1983 146 p
(Contract F49620-78-C-0071; AF Proj. 2307)
(AD-A136296; AFOSR-83-1217TR) Avail: NTIS HC A07/MF A01 CSCL 20/4

A study employing a combination of hydrogen bubble-wire flow visualization and hot-film anemometry measurements has been conducted to determine the effects sublayer scale streamwise surface modifications on the structure and flow characteristics of turbulent boundary layers. The surface modifications were created using very fine monofilament fishing line of an approximate non-dimensional height of h + = 4. Spanwise line spacings of 60 < s (+) < 160 were examined for a Reynolds number range 800 < Re sub theta < 1650. The hydrogen bubble-wire studies indicate that the lines appear to act as nucleation sites for low-speed streaks, but the influence of the lines on streak stabilization rapidly diminishes for y (+) > 10. Streak spacing distributions and statistics were developed from the visualization data for both modified and unmodified surfaces. These results clearly indicate that the surface modifications did affect the streak spacing characteristics, with the greatest effect of the lines on mean streak spacing distributions and statistics occurring for s (+) < 100. However, the visualizations indicate that for y (+) > 10 the determined streak spacing distributions and statistics, of an unmodified surface. GRA

N84-18586# Wisconsin Univ., Madison. Mathematics Research Center.
INFLUENCE OF SURFACE TENSION AND SURFACE SHEAR ON FINAL COAT THICKNESS IN JET-STRIPPED CONTINUOUS COATING OF SHEET MATERIALS Summary Report
E. O. Tuck and J. M. Vanden-Broeck Nov. 1983 22 p
(AD-A136402; AD-E000556; MRC-TSR-2602) Avail: NTIS HC A02/MF A01 CSCL 20/4

There are many situations in which a liquid film needs to be wiped off a solid surface, and one of the most common technological stripping mechanisms used for that purpose is a high-speed fluid jet. The industrial importance of this method of film wiping has prompted scientific studies of the process, but so far, these have accounted only for the pressure exerted by the jet on the film. This document gives consideration also to surface tension and tangential stresses, and analyzes under what circumstances they have an important influence on what can be achieved stripping a film with a jet. The equations governing the process in those circumstances are established and analyzed. Numerical results, moreover, are obtained which quantify the extent to which surface tension reduces the wiping effect of the jet. Author (GRA)

N84-18587# Naval Research Lab., Washington, D. C.
TIME DEPENDENT, COMPRESSIBLE SIMULATIONS OF SHEAR FLOWS: TESTS OF OUTFLOW BOUNDARY CONDITIONS Interim Report
J. P. Boris, E. S. Oran, M. J. Fritts, and C. Oswald 12 Dec. 1983 53 p
(RR0-1109)
(AD-A136410; AD-E000556; NRL-MR-5249) Avail: NTIS HC A04/MF A01 CSCL 20/4

Time dependent compressible numerical simulations of the onset of the Kelvin-Helmholtz instability in shear flows are described. The calculations performed use the Flux-Corrected Transport algorithm for solving the conservation equations for mass, momentum, energy on a two dimensional grid. A method of implementing outflow boundary conditions is discussed and detailed benchmarks are given for two problems: a round jet flowing into a quiescent background gas and a diaphragm in a barrel. Finally, two calculations are described: one of a round jet surrounded by a slower co-flowing gas and the other of a splitter plate.
Author (GRA)

N84-18588# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.
THE GENERATION OF THREE-DIMENSIONAL BODY-FITTED COORDINATE SYSTEMS FOR VISCOUS FLOW PROBLEMS Interim Report, May 1982 - Apr. 1983
Z. U. A. Warsi Jul. 1983 15 p
(Grant AF-80-0185; AF Proj. 2304)
(AD-A136503; AASE-83-256; AFOSR-83-1274TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

An analytical model for the generation and redistribution of surface coordinates which is to be used along with the full 3D code, has been developed. This essentially completes the development of spatial coordinates generation around multibodies and particularly around a wing-body combination in the 3D space. Numerical results for some multibody problems have been obtained. Author (GRA)

N84-18589# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
STABILITY OF COMPRESSIBLE WAKE AND JET FLOWS Final Report, Feb. 1982 - Feb. 1983
G. R. Verma, S. J. Scherr, and W. L. Hankey Nov. 1983 75 p
(Grant AF-AFOSR-0130-82; AF Proj. 2307)
(AD-A136541; AFWAL-TR-83-3100) Avail: NTIS HC A04/MF A01 CSCL 20/4

In this report the stability of compressible inviscid jets and wakes has been investigated for various wave numbers and Mach numbers for different velocity profiles. GRA

N84-18590# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
IMPLICIT NUMERICAL SOLUTION FOR A NORMAL SHOCK M.S. Thesis
C. M. Allen May 1983 93 p
(AD-A135855; AFIT/GAE/AE/82D-2) Avail: NTIS HC A05/MF A01 CSCL 20/4

There are basically two techniques used to solve the Navier-

Stokes equations for fluid flow. These techniques are implicit and explicit methods. Both methods along with characteristic boundary conditions for solving quasi-one-dimensional nozzle flow are presented. Two types of characteristic boundary conditions, those of Steger and McKenna, were tested for each scheme. Solutions of isentropic supersonic flow and flow with shocks were obtained for a diverging nozzle. The behavior of each boundary condition on both implicit and explicit schemes were the same. They deviated from the theoretical values by less than one percent. A test to determine the utility of each scheme was run by allowing the exit boundary conditions to change in the hope of forcing the shock to move upstream or downstream. The shock would not move in the implicit scheme for either boundary condition. The explicit scheme could move the shock, but only when Steger's boundary condition was used. (This is the one which specified only pressure.) Author (GRA)

N84-18591# PDA Engineering, Santa Ana, Calif.
HEAT TRANSFER MEASUREMENTS IN COLD WIND TUNNELS Final Report, 1 May 1980 - 26 Oct. 1981
H. L. Moody and K. Jechel Wright-Patterson AFB, Ohio AFWAL Sep. 1982 168 p
(Contract F33615-80-C-3002; AF Proj. 2307)
(AD-A135740; PDA-TR-5530-00-02; AFWAL-TR-81-3176) Avail: NTIS HC A08/MF A01 CSCL 20/13

Investigations were performed on instrumentation concepts for the purpose of acquiring heat transfer and recovery temperature measurements on models to be tested in cold wind tunnels. The problem in cold wind tunnels is the recovery and model initial (or ambient) temperature can be of the same level so that the temperature excursion during test is generally negligible. A literature search was performed from which 13 candidate instrumentation concepts were identified for further investigation. Detailed analysis and design efforts were performed on the candidates to identify measurement errors, fabrication, data reduction procedures and costs. Based on technical merit and cost, four sensors were selected for cold wind tunnel applications. These sensors include the 2-D foil (Gardon) and wafer thermopile calorimeters, liquid crystals and thermal phosphors. GRA

N84-18592# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
ANALYSIS OF THREE-DIMENSIONAL VISCOUS INTERNAL FLOWS Annual Report, 1 Mar. 1982 - 28 Feb. 1983
K. N. Ghia and U. Ghia Aug. 1983 38 p
(Grant AF-AFOSR-0160-80; AF Proj. 2307)
(AD-A135762; AFL-83-8-67; AFOSR-83-1053TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

In the first research category, two different areas were studied: Analysis of laminar duct flows, and study of laminar and turbulent separated flows. These studies were aimed at acquiring a better understanding of isolated physical phenomena significant to turbomachinery applications via the use of appropriate model problems. The second research category is aimed at obtaining flow-dependent computational grids efficiently so that critical regions can be accurately modeled. The final research category includes the analysis of numerical methods, with the goal of improving the efficiency and accuracy of the various methods developed and implemented. Preliminary fine-grid marching solutions were obtained in the entrance region of the duct for eight different duct configurations. Streamwise separation was examined, using the model problem of laminar flow through a constricted asymmetric channel. True transient results were obtained for several flow configurations with extremely fine grids, so as to provide benchmark solutions which can permit assessment of other solutions obtained using approximate methods. Turbulence modeling was pursued, with the wall region being described by low-remodeling. Although the wall region can be modeled more accurately by this method, the fine grids required retard the convergence rate of the approximate factorization method used. Flow-dependent grids were generated for a 1-D nonlinear viscous Burgers' equation. For the first time, accurate results were computed using totally central-difference schemes for Re up to 10,000. Finally, in the last category, in the area of semi-implicit methods, a multi-grid method was developed to provide fine-grid solutions for the Neumann problem. GRA

N84-18593# Harvard Univ., Cambridge, Mass.
NUMERICAL FLUID DYNAMICS
Garrett Birkhoff 1983 279 p
(Contract N00014-75-C-0596)
(AD-A135900) Avail: NTIS HC A13/MF A01 CSCL 20/4

Contents: Dynamics of Ideal Fluids; Compressibility and Viscosity; Von Neumann's Influence; Potential Flows; Sound Waves; Nonlinear One Dimensional Waves; Incompressible Viscous Flows; Lagrangian Dynamical Systems; Conformal Maps and Potential Flows; Fourier Analysis Navier-Stokes Equations; Molecular Models of Matter; 'Courant' Stability Conditions and Amplication Matrices; and Two Dimensional Airfoil Theory. GRA

N84-18594# Naval Research Lab., Washington, D. C.
POWER-SERIES SOLUTIONS OF THE GASDYNAMIC EQUATIONS FOR MACH REFLECTION OF A PLANAR SHOCK BY A WEDGE
D. L. Book, J. P. Boris, I. B. Bernstein, and M. A. Fry 2 Dec. 1983 29 p
(Y99-QAXS)
(AD-A135953; NRL-MR-5229) Avail: NTIS HC A03/MF A01 CSCL 19/4

The self-similar solutions to the problem of a planar shock with Mach number reflecting obliquely from a wedge with vertex angle are obtained to arbitrary accuracy by expanding the fluid quantities in power series in scaled variables. For single Mach reflection, there are four distinct regions, (1) the ambient gas ahead of the incident shock; (2) the gas behind the incident shock and outside the reflected (bow) shock; (3) the region bounded by the Mach stem, the wedge, and the contact surface (slip line) extending from the triple point; and (4) the doubly shocked medium bounded by the contact surface, wedge, and reflected shock. In region (2) the solution is known immediately in terms of Mach number and vertex angle and the conditions in (1). The resulting algebraic equations are solved subject to the additional relations obtained by applying the reflection conditions on the wedge, together with the jump conditions on the boundaries ac and bd, approximated by power series expansions of the F and G functions. Since all these equations are nonlinear, solutions are obtained by iteration with N increasing until convergence is obtained. The Ben-Dor equation for the fluid quantities in regions c,d, at the triple point is used to give initial values. The method generalizes readily to complex and double Mach reflections. GRA

N84-18595# Naval Postgraduate School, Monterey, Calif.
IMPULSIVELY-STARTED FLOW ABOUT RECTANGULAR CYLINDERS M.S. Thesis
C. J. Ihrig Sep. 1983 117 p
(AD-A136029) Avail: NTIS HC A06/MF A01 CSCL 20/4

Impulsively-started flow about sharp-edged rectangular cylinders has been investigated experimentally. The forces acting on the bodies have been determined, as a function of the relative displacement of the fluid at a subcritical Reynolds number, for various angles of attack. The results have shown that the shedding of the first two or three vortices and the manner in which they are generated have profound effects on all the characteristics of resistance. The results have also shown that the drag force in the transient state is always larger than that in the asymptotic steady state, pointing out the importance of the understanding of impulsively-started flow about bluff bodies. The data presented here are expected to form the basis of future numerical analyses of similar time-dependent flows. At present, accurate analytical and numerical data, for comparison with those presented herein, do not exist, save for the later stages of motion where the behavior of flow becomes nearly identical to that of steady flow.
Author (GRA)

N84-18596# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.

AN OBJECTIVE WAVEFORM COMPARISON TECHNIQUE Final Report
G. Y. Baladi and D. E. Barnes Oct. 1983 89 p
(Y99-QAXS)
(AD-A136130; WES/TR/SL-83-4) Avail: NTIS HC A05/MF A01 CSCL 19/4

This report documents the development of objective waveform discrepancy measures for comparing arbitrary transient response histories. The objective waveform discrepancy measures consist of the magnitude correlation factor, the phase-and-frequency correlation factor, the magnitude error, the phase-and-frequency error, and the combined magnitude and phase-and-frequency errors. Their validity and behavior are checked and demonstrated for several simple sinusoidal responses. The objective discrepancy measures are incorporated into a computer program, named Waveforms Comparison Technique, which processed digitized data tapes containing measured or calculated waveforms or both. The computer program is used to statistically analyze selected data from the DISC Test 1 event and objectively compare particle velocity measurements made in DISC Test 2 with expected value waveforms obtained from probabilistic prediction calculations. Appendix A of this report presents a flow chart and user's guide for the computer program WCT. It is recommended that the objective discrepancy measures be used whenever comparisons of two or more waveforms are made. It is also recommended that the technique be extended to objectively quantify differences in laboratory-and field-generated material property test results. Author (GRA)

N84-18597# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mathematics.
[THE NUMERICAL SOLUTION OF INCOMPRESSIBLE NAVIER-STOKES EQUATIONS] Interim Technical Report, 1 Jun. 1982 - 31 May 1983
R. A. Nicolaides May 1983 10 p
(Grant AF-AFOSR-0213-82; AF Proj. 2304)
(AD-A136158; AFOSR-83-1092TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

During this period, research continued in the area of numerical solution of the incompressible Navier-Stokes equations. In particular, the following topics have been addressed: (1) The question of achieving stable discretizations of the imcompressibility constraint; (2) The problem of obtaining accurate solutions in the limit of large Reynolds numbers; and (3) Devising efficient numerical solution algorithms for solving the nonlinear algebraic systems of equations arisings from the discretization step. A necessary condition for convergence of the discrete approximation was obtained. A major result achieved has been to show that many often used low order element pairs are, in fact, unstable in the sense of this criterion. In addition, new simple low order element pairs were introduced and proved to be stable. Concerning the second topic noted above, the investigator has taken an approach based on the idea that h (the discretization parameter) needs to be small only in certain locations, namely in boundary layers. Finally, solving the algebraic systems which arise from the discretization remains a major difficulty. Two new approaches have been developed, one dependent on time marching to the steady state limit, and the other based on an adaptation of a method used in structural mechanics to the fluids case. Four new scientific papers have been generated in the report period, to be published in the referred literature. Author (GRA)

N84-18598# JAYCOR, Alexandria, Va.
INVESTIGATION OF THE THERMAL INITIATION OF DETONATION IN NITROMETHANE Final Report, 16 Jun. 1982 - 16 Mar. 1983
R. H. Guirguis 21 Oct. 1983 32 p
(Contract N00014-82-C-2253)
(AD-A136211; JAYCOR-J206-83-011/6223) Avail: NTIS HC A03/MF A01 CSCL 19/1

Shock tube experiments and extensive numerical simulations were used to provide information required to construct a detailed chemical mechanism for the decomposition of gaseous nitromethane diluted in argon. Measurements were made of the time evolution of the pressure and the NO adsorption at a fixed location in the shock tube, and mass and infrared spectroscopy were used to identify the products. Experiments were performed in the pressure range 0.3 to 2.5 atms and temperature range 700 to 2000 K using mixtures of 10 to 100 percent nitromethane in argon. A mechanism composed of elementary reactions describing nitro-methane decomposition in the range of the experiments was compiled, tested and reduced to a set of 62 most significant reactions. GRA

N84-18599# Texas A&M Univ., College Station. Turbomachinery Labs.
ROTORDYNAMIC FORCES DEVELOPED BY LABYRINTH SEALS Annual Report, 1 Sep. 1982 - 31 Aug. 1983
D. W. Childs and D. L. Rhode Oct. 1983 43 p
(Contract F49620-82-K-0083; AF Proj. 2307)
(AD-A136217; AFOSR-83-1133TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Numerous tasks have been completed in developing measurement and prediction techniques for accurately determining the fluid-structure-interaction forces on labyrinth seal rotors. The best facility has been designed, fabricated, and assembled; the drive mechanism and instrumentation system have been tested. Further, various improvements to the test apparatus have been implemented. Also, the development of two basic computational approaches for predicting seal rotor forces has been successfully completed. These consist of an improved but approximate analytical model and an extensive computer program incorporating the complete Reynolds-averaged Navier-Stokes equations. The latter model solves finite difference equations in predicting the two-dimensional (axisymmetric) compressible flow in a concentric-rotor labyrinth seal cavity. Details of a corresponding incompressible flow prediction are presented and discussed. The final numerical model will allow prediction of the desired three-dimensional, eccentric-rotor flow field and the associated rotordynamic forces. GRA

N84-18600*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL CONDUCTIVITY BEHAVIOR OF BORON CARBIDES
Charles Wood, Andrew Zoltan, David Emin (Sandia National Lab.), and Paul E. Gray (GA Technologies, Inc.) 1983 10 p refs Presented at the 18th Intern. Thermal Conductivity Conf., Rapid City, S.D., 3 Oct. 1983 Sponsored by contract with NASA
(Contract DE-AC04-76DP-00789)
(NASA-CR-173165; NAS 1.26:173165; DE84-003208; SAND-83-2326C; CONF-8310163-10) Avail: NTIS HC A02/MF A01 CSCL 20D

Knowledge of the thermal conductivity of boron carbides is necessary to evaluate its potential for high temperature thermoelectric energy conversion applications. The thermal diffusivity of hot pressed boron carbide B/sub 1-x/C/sub x/ samples as a function of composition, temperature and temperature cycling was measured. These data in concert with density and specific heat data yield the thermal conductivities of these materials. The results in terms of a structural model to explain the electrical transport data and novel mechanisms for thermal conduction are discussed.DOE

N84-18601# Texas Technological Univ., Lubbock. Dept. of Mathematics.
MATHEMATICAL METHODOLOGY FOR EVALUATING SIMULATION OF FLOW IN POROUS MEDIA Final Report, 1 Feb. 1980 - 31 Aug. 1983
W. T. Ford and R. M. Anderson Jan. 1984 170 p refs
(Contract DE-AC19-80BC-10257)
(DE84-004775; DOE/BC-10257/59) Avail: NTIS HC A08/MF A01

A methodology for evaluation of reservoir simulators was developed. Tests of resolution of numerical computational difficulties and of compatibility of correlations used in representation of fluid properties and phase flow interference were studied. A similarity concept which allows testing of simulators to be based

on solution of a system of ordinary differential equations, referred to as a Similarity Porous Media System (SPMS), rather than on the usual system of partial differential equations, referred to as a Porous Media System (PMS) is used. The SPMS can be solved with the same computational effort as would be required for a single time step in the usual application of the PMS itself. The SPMS consists of study of possible level curves, also called similarity curves, on which all the unknowns in the PMS are constant. The SPMS can be used, on a family of parabolas, for a simulator restricted to porous media problems with circular symmetry. Simulation of an actual reservoir problem imposes field conditions on a simulator's solution of the PMS, but use of the similarity concept in evaluation of a simulator involves imposition of selected samples from a solution of the SPMS as conditions on a solution of the PMS by the simulator. The solution of the PMS is checked against a solution predicted by the solution of the SPMS. DOE

N84-18602# Electricite de France, Chatou. Div. Aerorefrigerants.

INVESTIGATION OF A RAINWATER FLOW AND TEMPERATURE MEASURING DEVICE IN A MOIST ATMOSPHERE REFRIGERANT [ETUDE D'UN DISPOSITIF DE MESURES DU DEBIT ET DE LA TEMPERATURE D'EAU DE PLUIE DANS UN REFRIGERANT ATMOSPHERIQUE HUMIDE]

J. Y. Simon 29 Apr. 1982 34 p refs In FRENCH Original contains color illustrations

(HT-31.82.11) Avail: NTIS HC A03/MF A01

A device for measuring local rainwater temperature and flow rates above the cold water basin of atmospheric refrigerants was constructed. The device is used to study wind effects on the refrigerants. Flow asymmetries and heat exchange between refrigerants can be studied. Initial and final states of two fluids can be determined. It can be used to measure the characteristics of any rain with density between 6 and 50 cum/hr/sqm. Author (ESA)

N84-18603# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

THREE-DIMENSIONAL BOUNDARY LAYER CALCULATIONS ON WINGS, STARTING FROM THE FUSELAGE

J. P. F. Lindhout, E. deBoer, and B. vandenBerg 31 Dec. 1982 12 p refs Presented at 2nd Symp. on Numerical and Phys. Aspects of Aerodyn. Flows, Long Beach, Calif., 17-20 Jan. 1983 Sponsored by Netherlands Agency for Aerospace Programs (NIVR)

(NLR-MP-82060-U) Avail: NTIS HC A02/MF A01

A computational method for three dimensional turbulent boundary layers is presented. The turbulence model is a simple eddy viscosity formulation. A hybrid difference scheme which has the robustness of first order schemes and accuracy of second order schemes is used. The boundary layer is computed in the region of determinacy of the initial data. No extra data has to be given along the lateral boundaries of the computational domain. Results of the boundary layer flow over the fuselage of an aircraft-like body are presented. The computation follows the strongly three dimensional flow over the leading edge of the fairing and wing, after the boundary layer on wing upper and lower surface is computed. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-18604 Overseas Relations Branch Translation Service, London (England).

ROTATING CATHODE DEVICE FOR MOLTEN SALT BATH

30 Nov. 1983 8 p Transl. into ENGLISH of Japanese Patent no. 57(1982)-26350 (1 Sep. 1975)

(BLL-OA-Trans-3173-(6196.3)) Avail: British Library Lending Div., Boston Spa, Engl.

The invention relates to a rotating cathode device for molten salt baths used to prepare metallic titanium or aluminum and the like by electrolysis of molten salts. The rotating cathode device is described. It is a cyclindrical cathode mounted on a rotating spindle, made of a lightweight material and mounted in such a way as to avoid thermal strain between the rotational shaft and the cylindrical cathode. At least one of the upper and lower ends of the cylindrical cathode are closed by a cap and a seal consisting of an inorganic fiber composite in the area between the cap and the cathode. S.L.

N84-18605 Royal Signals and Radar Establishment, Malvern (England).

SENSOR HEAD PERFORMANCE, RESPONSIVITY AND NETD USING PYROELECTRIC LINEAR ARRAYS

R. Watton and C. Smith Jul. 1983 43 p refs

(RSRE-Memo-3608; BR89786) Copyright. Avail: Issuing Activity

The use of linear pyroelectric arrays in IR sensor heads in which the scene is panned across, or traverses, the array was analyzed, using an array structure consisting of a pyroelectric wafer, a bonding layer and a substrate. The responsivity of the array for a moving radiation pattern, the responsivity corrected by the amplifier for the fall with temporal frequency, the integrated noise in the bandwidth, and noise equivalent temperature difference (NETD) were calculated. Typical values were plotted against the spatial frequency of the radiation pattern. Variations with image speed and with the angle of the pattern to the direction of movement are shown. The performance is attractive for a number of applications, with NETD values in the region of 0.1 to 0.3 C where a moderate bandwidth applies. However, at low frequencies imposed by slow image speeds, the need for reticulation is demonstrated. Author (ESA)

N84-18606# Aeronautical Research Labs., Melbourne (Australia).

SOME ASPECTS OF THE COMPATIBILITY BETWEEN STRAIN GAUGE READOUT EQUIPMENT AND MULTI-COMPONENT WIND TUNNEL BALANCES

N. Pollock Jul. 1983 28 p refs

(ARL-Aero-Note-417; AR-002-966) Avail: NTIS HC A03/MF A01

In multicomponent strain gauge wind tunnel balances it is common to use four arm bridges of gauges arranged to produce an output from one load component and not from other load components which also cause significant strains under the gauges. This system relies on the fact that there is fundamentally one output producing pattern of strains and three nonoutput producing patterns. It is shown that interactions arise between the various strain patterns and that these interactions, and hence the balance calibration equations, are dependent on the nature of the readout equipment used. Specific precautions which must be observed to obtain 0.01% accuracy levels are investigated. Author

N84-18607*# Modar, Inc., Natick, Mass.

EVALUATION OF ORGANIC CARBON ANALYZERS FOR SPACE APPLICATION Final Report

Feb. 1984 37 p refs

(Contract NAS9-16675)

(NASA-CR-171755; NAS 1.26:171755) Avail: NTIS HC A03/MF A01 CSCL 14B

The state-of-the-art technology for organic carbon analysis in space applications is evaluated. An investigation into total organic carbon (TOC) analysis has identified a variety of schemes which include different methods for: (1) separation of inorganic carbon from organic carbon and/or differentiation of inorganic carbon from organic carbon; (2) reaction of organic carbon to form a quantifiable

species; and (3) detection and measurement of that species. Each method option is discussed. S.L.

N84-18608# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering.
WIDEBAND MONOLITHIC MICROWAVE AMPLIFIER STUDY Final Technical Report, 1 Jul. 1980 - 30 Sep. 1983
J. B. Beyer, S. N. Prasad, J. E. Nordman, R. C. Becker, and G. K. Hohenwarter Sep. 1983 96 p
(Contract N00014-80-C-0923; RR0-2102)
(AD-A136424; ECE-83-6) Avail: NTIS HC A05/MF A01 CSCL 09/5

Work is continued on the analysis and design of GaAs FET distributed amplifiers. Design tradeoffs are established for type of device, number of devices, gain, impedance level and line cutoff frequency. The procedure for achieving the maximum gain-bandwidth product is detailed. Preliminary work on a broadband 0-360 degrees phase shifter is reported. The design of an integral part of the phase shifter, a distributed paraphase amplifier from 2 - 20 GHz, is presented. Author (GRA)

N84-18609# Defence Research Establishment, Ottawa. (Ontario).
PROCEDURES FOR STATIC AND CONSTANT-RATE TESTS ON A SINGLE-DEGREE-OF-FREEDOM (SDF) STRAPDOWN GYROSCOPE
R. Apps and M. Vinnins Oct. 1983 22 p
(AD-A136632; DREO-TN-83-18) Avail: NTIS HC A02/MF A01 CSCL 14/2

Test procedures for testing a rate-integrating, Single-Degree-of-Freedom strapdown gyroscope are presented. Tests are restricted to static and constant-rate modes in both inertial reference servo and analog-torque-to-balance configurations. Alignment procedures and adopted sign conventions are discussed. Temperature control considerations are described. Author (GRA)

N84-18610# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A SINE-WAVE GRATING CONTROLLER FOR VISION TESTING M.S. Thesis
B. D. Baxley Mar. 1983 158 p
(AD-A135871; AFIT/GE/EE/83M-1) Avail: NTIS HC A08/MF A01 CSCL 14/2

This report summarizes design, development and testing of a microprocessor-based system that controls brightness and contrast levels of video monitors. This controller is to be used by scientists in maintaining calibration of video monitors during vision research. Prototype hardware for a video controller was designed and built. The controller requires a sine-wave grating to be displayed on a cathode ray tube (CRT). Luminance samples are measured directly from the CRT via a 512-element photodiode array. Analog information from the array is digitized and stored in a Z80 microcomputer. The sampled data are then used to compute CRT brightness and contrast. Computed brightness and contrast values are compared with desired values, and corrections are made to brightness and contrast control circuits for the video monitor. Most of the hardware required for the controller was built and tested. Hardware completed included the video sampling and digitizing circuits, as well as Z80 input/output and user interface circuits. In addition, all of the controller software was written and tested. Additional development is required before a working controller can be demonstrated. Brightness and contrast control circuits must be built and tested. Anomolies in performance of the commercially-procured video sampling circuits should be examined. Finally, closed-loop system operation must be tested and analyzed.
Author (GRA)

N84-18611# Dynatron Corp., Waltham, Mass.
A TIMING AND MEMORY SIZING STUDY FOR WAVENUMBER ANALYZER Final Report, 1 Aug. - 5 Dec. 1983
R. W. Zaorski, J. Dolansky, and B. E. McCann 5 Dec. 1983 39 p
(Contract N00014-83-C-0728; DARPA Order 4462)
(AD-A135581) Avail: NTIS HC A03/MF A01 CSCL 14/2

It is desired to perform frequency-wave number analysis on data from a PxQ element hydrophone array. It is assumed that the array may be mapped onto a plane, a sector of a sphere or a sector of a cylinder. A 3-dimensional frequency-wave number, averaged spectrogram is to be computed. The computation is to be performed using a VAX 11/780 mainframe computer in combination with an FPS AP-120B floating point array processor. All input, output and intermediate data is to be stored on RP06 disk drives. This report presents an evaluation of computation time, AP120B array processor memory requirements and disk storage requirements as a function of N=PxQ and M, the number of frequency cells to be analyzed. The evaluation is based on a preliminary software design with the intent of obtaining 'order of magnitude' sizing extimates. Equations are presented relating computation time and disk storage requirements to P, Q and M independently for both the temporal processing (time to frequency computation for each hydrophone waveform) and the spatial processing (2-dimensional wave number computation for each frequency cell selected). The equations have been evaluated using BASIC and the BASIC programs have been included along with representative results for selected values of P, Q and M.
Author (GRA)

N84-18612# Honeywell Electro-Optics Center, Lexington, Mass.
HOLOGRAPHIC FLI (FRINGE LINEARIZATION INTERFEROMETRY) FOR DETECTION OF DEFECTS Interim Report, 15 Jan. - 15 Aug. 1983
G. O. Reynolds, D. A. Servaes, J. B. DeVelis, D. Peirce, and R. Mayville 8 Oct. 1983 73 p
(Contract F49620-82-C-0001; AF Proj. 2306)
(AD-A135663; 8309-38; AFOSR-83-1058TR) Avail: NTIS HC A04/MF A01 CSCL 14/5

This interim report describes the work performed during the first half of Phase 2 on the two step holographic fringe linearization interferometry study. The FLI process consists of deflecting the object beam between holographic exposures to create linear fringes and spatial filtering of the image reconstructed from the hologram about the linear fringe carrier frequency. This filtering is meant to discriminate between subsurface defects and random fringe noise. During this phase a loading limitation for the FLI process (of one quarter wave/linear fringe period for the out of plane deformations) was demonstrated. To circumvent this limitation two modifications to the FLI process were investigated: four-exposure FLI - a moire technique and laser pulse separation control with dynamic loading. With the former method linear fringes have been recovered from the random noise in a simulated laboratory experiment. Experiments to demonstrate the fringe shifts at defect locations with differential loading are still in progress. Preliminary experiments performed on the NADC holographic system indicate that it should be adequate, albeit cumbersome, to demonstrate the laser pulse control method. The finite element analysis is predicting the experimental fringe patterns obtained with static loading and the modeling effort for the dynamic loading experiments is discussed. Plans for the work to be done during the remainder of Phase 2 are given. Author (GRA)

N84-18613# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
MECHANICAL DETAILS OF A MODIFIED HAMILTON FRAME VELOCIMETER
J. E. Matthews and D. C. Young Sep. 1983 23 p
(AD-A136180; NORDA-TN-227) Avail: NTIS HC A02/MF A01 CSCL 14/2

The Hamilton Frame is a velocimeter used aboard the Deep Sea Drilling Project (DSDP) drill ship GLOMAR CHALLENGER, and at the Naval Ocean Systems Center (NOSC), to measure the compressional wave velocity within sediment and rock samples. The design of this instrument has been modified at the Naval Ocean Research and Development Activity (NORDA) to permit both compressional and shear wave velocity measurements. The modified device also monitors the transducer induced stress on the sample material, a factor which is critical to some measurement. This report documents, with mechanical drawings and photographs,

the mechanical details of the Modified Hamilton Frame in use at NORDA. Author (GRA)

N84-18614# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
THE GOES X-RAY IMAGER FEASIBILITY DEMONSTRATION
James R. Cessna, Richard B. Hoover, Richard N. Grubb, Prentice L. Orswell, and John H. Taylor Feb. 1983 90 p refs
(PB84-11970; NOAA-TR-ERL-423; SEL-41; NOAA-83102502) Avail: NTIS HC A05/MF A01 CSCL 14B

The major components of an X-ray and EUV imager suitable for operational use on the NOAA Geostationary Operational Environmental Satellites (GOES) were fabricated and tested. The design and fabrication techniques used for the X-ray mirror are described. Results are given for both X-ray and visible-light tests of the mirror and a charge coupled device (CCD) imaging detector. These include the successful demonstration of image 'despinning,' i.e., the integration of an image moving across the detector to increase integration time and therefore sensitivity. This technique would be necessary to design a practical instrument for use on a spin-stabilized spacecraft such as the present GOES satellite. GRA

N84-18615# Bureau of Mines, Albany, Oreg. Research Center.
BALL-ON-BLOCK IMPACT-SPALLING WEAR TEST AND RESULTS ON SEVERAL IRON ALLOYS
R. Blickensderfer and B. L. Forkner Sep. 1983 25 p refs
(PB84-115633; BM-RI-8794) Avail: NTIS HC A02/MF A01 CSCL 14B

An impact wear testing machine was devised that simulates the repeated impact conditions encountered in large milling and grinding operations where breakage and spalling are problems. The apparatus provides data on materials that may help in the design of alloys with improved resistance to deformation, spalling, and breakage. The test blocks are 96 cu in. Impacts are produced by dropping 3-in-diam balls weighing 4 lb from a height of 10 ft. Tests were run until breakage occurred or to a total of 100,000 impacts. Four types of failures of the test block were observed: (1) cold flow of the bulk material by plastic deformation, (2) flaking of the surface in the impact region, (3) spalling of the block to form a crater in the region of impact, and (4) breakage of the test block into two or more major pieces. The effects of composition, heat treatment, microstructure, and hardness on types of failure are discussed. GRA

N84-18616# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
PICOSECOND TIME DIFFERENCE MEASUREMENTS UTILIZING CAMAC-BASED ANSI/IEEE-488 DATA ACQUISITION HARDWARE. OPERATING MANUAL IE3, VERSION 1.0
D. J. Glaze and S. R. Stein Sep. 1983 38 p
(PB84-116011; NBS-TN-1056) Avail: NTIS HC A03/MF A01 CSCL 14B

Automated time-difference measurements at the pico-second level were achieved. The system described combines the best properties of three common methods: the single heterodyne measurement technique, the frequency divider, and the dual-mixer time-difference measurement system. This particular system combines two instrumentation standards, ANSI/IEEE-583 and ANSI/IEEE-488 with modular dual mixer time difference measurement hardware. The modular, standardized hardware together with the measurement techniques permit the data acquisition modules to be contained in a standard CAMAC crate. This system, along with an external controller, is capable of measuring eight clocks, at the present time, and is expandable to twenty-four clocks with modified software and additional measurement modules. GRA

N84-18617# California Univ., Richmond. Center for Earthquake Engineering.
TRANSDUCER FOR MEASURING THE INTERNAL FORCES IN THE COLUMNS OF A FRAME-WALL REINFORCED CONCRETE STRUCTURE
Richard Sause and V. V. Bertero May 1983 112 p refs
(Grant NSF PFR-80-09478)
(PB84-119494; UCB/EERC-83/05) Avail: NTIS HC A06/MF A01 CSCL 13M

An internal force transducer (IFT) capable of accurately measuring the internal forces of the first story columns of a 1/5 scale model of a seven story frame-wall reinforced concrete structure was designed, developed, and applied in this structure under static and dynamic loading conditions. Although this IFT was developed specifically for research on this structure, the feasibility considerations, the development of design criteria, the design and fabrication considerations, and the calibration and installation methods reported herein have more general applicability. GRA

N84-18618# Northrop Services, Inc., Research Triangle Park, N.C. Environmental Chemistry and Emissions Research Dept.
EMPIRICAL BACKGROUND CALCULATION METHOD FOR MULTI-CHANNEL X-RAY SPECTROMETERS
R. B. Kellogg 1983 19 p refs Presented at the 32nd Ann. X-ray Conf., Denver, Aug 1983
(Contract EPA-68-02-4033)
(PB84-130475; EPA-600/D-84-028) Avail: NTIS HC A02/MF A01 CSCL 14B

A method of background calculation was developed which is applicable to fixed-channel wavelength dispersive spectrometers which cannot directly measure background. The X-ray intensities from a set of high- and low-average atomic number standards are fitted against Rayleigh and Compton scatter parameters to an equation of the form: y - a (x sub 1) + b (x sub 2) + c. Y is the calculated intensity, x(1) and x(2) are Rayleigh and Compton scatter parameters, and c is a constant. Correlation coefficients greater than 0.99 and slopes of 1.00 are obtained for most elements measured. Calculated and measured backgrounds as well as concentrations are reported for selected standard reference materials. GRA

N84-18619# Carnegie-Mellon Univ., Pittsburgh, Pa. Inst. of Technology.
WORKSHOP ON MAGNETIC INFORMATION TECHNOLOGY (MINT)
Alfred B. Bortz and Susan B. Dunkle 1983 41 p refs Workshop held in Washington, 22-24 Jun. 1983
(Grant NSF OIR-83-12023)
(PB84-125210; NSF/OIR-83002) Avail: NTIS HC A03/MF A01 CSCL 14C

Questions addressed at the workshop are listed, including: (1) What are the Magnetic Information Technology (MINT) research needs in such areas as electronics, materials, surface science, magnetic phenomena and devices, aerodynamic aspects of magnetic systems, signal processing, and tribology as it bears on magnetics, (2) How should MINT research be addressed and conducted in the university environment, and (3) What are the vehicles in the university environment needed to facilitate addressing MINT issues. The MINT research is outlined. The need for research in the following areas is identified: magneto-optic recording, magnetic bubbles, particulate material recording, and thin film media. GRA

N84-19230# Cambridge Univ. (England). Inst. of Astronomy.
INTERNAL CALIBRATION OF ASTRONOMICAL PHOTOGRAPHS
P. S. Bunclark and M. J. Irwin *In* ESA Statist. Methods in Astron. Nov. 1983 p 195-200 refs Sponsored by UK Science and Engineering Research Council (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-18620*# Westinghouse Research and Development Center, Pittsburgh, Pa.

MEASUREMENT OF HEAT PUMP PROCESSES INDUCED BY LASER RADIATION
M. Garbuny and T. Henningsen Nov. 1983 50 p refs
(Contract NAS3-22877)
(NASA-CR-168324; NAS 1.26:168324; W-R/D-83-9C1-LK00L-R1)
Avail: NTIS HC A03/MF A01 CSCL 20E

A series of experiments was performed in which a suitably tuned CO2 laser, frequency doubled by a TI3AsSe37 crystal, was brought into resonance with a P-line or two R-lines in the fundamental vibration spectrum of CO. Cooling or heating produced by absorption in CO was measured in a gas-thermometer arrangement. P-line cooling and R-line heating could be demonstrated, measured, and compared. The experiments were continued with CO mixed with N2 added in partial pressures from 9 to 200 Torr. It was found that an efficient collisional resonance energy transfer from CO to N2 existed which increased the cooling effects by one to two orders of magnitude over those in pure CO. Temperature reductions in the order of tens of degrees Kelvin were obtained by a single pulse in the core of the irradiated volume. These measurements followed predicted values rather closely, and it is expected that increase of pulse energies and durations will enhance the heat pump effects. The experiments confirm the feasibility of quasi-isentropic engines which convert laser power into work without the need for heat rejection. Of more immediate potential interest is the possibility of remotely powered heat pumps for cryogenic use, such applications are discussed to the extent possible at the present stage. Author

N84-18621# Rochester Univ., N. Y. Lab. for Laser Energetics.
DEVELOPMENT OF X-RAY LASER MEDIA. MEASUREMENT OF GAIN AND DEVELOPMENT OF CAVITY RESONATORS FOR WAVELENGTHS NEAR 130 ANGSTROMS, VOLUME 1 Annual Scientific Report, 1 Jan. - 31 Dec. 1982
J. M. Forsyth Feb. 1983 164 p 3 Vol.
(Grant AF-AFOSR-0059-81; AF Proj. 2301)
(AD-A136305; AFOSR-83-1136-Vol-1TR) Avail: NTIS
HC A08/MF A01 CSCL 20/5

A two part study of soft X-ray laser media is presented. Experimental observation of significant population inversion on the Balmer alpha transition in hydrogen-like flourine at 81 A in a line-focus laser plasma is reported. An analysis of the expected performance of soft X-ray multilayer reflects is presented. This volume discusses the development of an XUV (extreme ultraviolet) amplifier. GRA

N84-18622# Rochester Univ., N. Y. Lab. for Laser Energetics.
DEVELOPMENT OF X-RAY LASER MEDIA. MEASUREMENT OF GAIN AND DEVELOPMENT OF CAVITY RESONATORS FOR WAVELENGTHS NEAR 130 ANGSTROMS, VOLUME 2 Annual Scientific Report, 1 Jan. - 31 Dec. 1982
J. M. Forsyth Feb. 1983 217 p 3 Vol.
(Grant AF-AFOSR-0059-81; AF Proj. 2301)
(AD-A136306; AFOSR-83-1136-Vol-2TR) Avail: NTIS
HC A10/MF A01 CSCL 14/2

The characteristic properties of multilayer reflectors for X-ray and XUV radiation (1A - 600A) permit solutions to Maxwell's equations for a quasi-periodic reflector whose layers may contain arbitrary index gradients. This solution can be formulated as a difference equation that propagates the amplitude reflectance across each layer pair. The difference equation resembles the Airy summation for single layers, but has a simpler Ricatti form. From the difference equation, design criteria can be derived for maximization of multilayer reflectivity. These criteria provide guidance in the selection of appropriate multilayer materials, and are used to derive approximate scaling laws for multilayer reflecting properties. The reflecting properties of X-ray multilayer devices are discussed. A.R.H.

N84-18623# Rochester Univ., N. Y. Lab. for Laser Energetics.
DEVELOPMENT OF X-RAY LASER MEDIA. MEASUREMENT OF GAIN AND DEVELOPMENT OF CAVITY RESONATORS FOR WAVELENGTHS NEAR 130 ANGSTROMS, VOLUME 3 Annual Scientific Report, 1 Jan. - 31 Dec. 1982
J. M. Forsyth Feb. 1983 203 p 3 Vol.
(Grant AF-AFOSR-0059-81)
(AD-A136307; AFOSR-83-1136-Vol-3TR) Avail: NTIS
HC A10/MF A01 CSCL 20/8

In this document the authors summarize our investigation of the reflecting properties of X-ray multilayers. The breadth of this investigation indicates the utility of the difference equation formalism in the analysis of such structure. The formalism is particularly useful in analyzing multilayers whose structure is not a simple periodic bilayer. The complexity in structure can be either intentional, as in multilayers made by in-situ reflectance monitoring, or it can be a consequence of a degradation mechanism, such as random thickness errors or interlayer diffusion. Both the analysis of thickness errors and the analysis of interlayer diffusion are conceptually simple, effectively one dimensional problems that are straightforwared to pose. In the authors analysis of in-situ reflectance monitoring, they provide a quantitative understanding of an experimentally successful process that has not previously been treated theoretically. As X-ray multilayers come into wider use, there will undoubtedly be an increasing need for a more precise understanding of their reflecting properties. Thus, it is expected that in the future more detailed modeling will be undertaken of less easily specified structures than those above. The authors believe that their formalism will continue to prove useful in the modeling of these more complex structures. One such structure that may be of interest is that of a multilayer degraded by interfacial roughness. GRA

N84-18624# Boston Univ., Mass. Dept. of Chemistry.
PRODUCTS OF PHOTODEGRADATION FOR COUMARIN LASER DYES Technical Report, 1 Jan. - 31 Oct. 1982
Guilford Jones, II, W. R. Jackson, S. Kanoktanaporn, and W. R. Bergmark 31 Oct. 1983 15 p Submitted for publication
(Contract N00014-79-C-0054; NR Proj. 395-609)
(AD-A136308; TR-7) Avail: NTIS HC A02/MF A01 CSCL 11/3

The products of conventional photolysis of the coumarin laser dyes, Cl, C35, Cl53, and Cl52 have been investigated. The previously reported dealkylation of Cl is documented for the fluorinated dyes, C35, and Cl52 in deaerated solvents. In addition, a reduction product is identified for Cl, consistent with a radical mechanism for decomposition. Evidence is provided that the concentration quenching (self quenching) of singlet dye is important to the degradation mechanism. For the rigid dye, C153, a photo-oxidation product involving the amine functionality results from decomposition in aerated media. For several dyes, very low triplet yields have been measured. Author (GRA)

N84-18625# Stanford Univ., Calif. Lab. of Physics.
THE MARK 3 LINAC AS A HIGH CURRENT SOURCE FOR FEL (FREE ELECTRON LASERS) EXPERIMENTS Final Technical Report, 31 Mar. 1982 - 30 Mar. 1983
Mason R. Yearian 3 Nov. 1983 37 p
(Contract F49620-82-K-0022; AF Proj. 2301)
(AD-A136312; AFOSR-83-1235TR) Avail: NTIS
HC A03/MF A01 CSCL 20/7

The basic objective of this research was to determine the feasibility of the conversion of the Stanford Mark 3 linac to high-gradient operation to serve as an injector or driver for storage ring and single pass free electron laser experiments. The Mark 3 single section tests have been generally successful. In particular, it has been observed that the Mark 3 accelerator sections are capable of operating reliably and stably at high gradient if an appropriate vacuum is maintained in the structure, and if appropriate steps are taken to bake out the adsorbed contamination on the cavity walls. Electrons have also been accelerated in the test section to an energy in excess of 40 MeV. GRA

N84-18626# Boston Univ., Mass. Dept. of Chemistry.
PHOTOCHEMISTRY AND PHOTOPHYSICS OF LASER DYES Final Report, 1 Nov. 1978 - 31 Oct. 1982

G. Jones, II 31 Oct. 1983 11 p
(Contract N00014-79-C-0054; NR Proj. 395-609)
(AD-A136330; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/5

Results of a study of photophysical properties and mechanisms of photodegradation of coumarin dyes are summarized. Discussion includes effects of polar media on dye emission yield and lifetime, solubilization of dyes in water with surfactants, products of dye photodegradation, electron transfer properties of coumarin dyes, mechanisms of dye photodecomposition, and recommendations of restorative procedures for dye media. GRA

N84-18627# Austin Research Associates, Inc., Tex.
THEORETICAL STUDIES ON FREE ELECTRON LASERS Final Technical Report, 1 Oct. 1982 - 30 Sep. 1983
M. N. Rosenbluth, H. Vernon Wong, and B. N. Moore Nov. 1983 129 p
(Contract F49620-81-C-0077; ARPA Order 3923; AF Proj. 2301)
(AD-A136333; I-ARA-83-U-62; ARA-502; AFOSR-83-1204TR) Avail: NTIS HC A07/MF A01 CSCL 20/5

The subject of this investigation has been the Free Electron Laser (FEL), a device which is capable of converting the kinetic energy of a relativistic electron beam into coherent electromagnetic radiation. The investigation focused on two main topics: (1) The FEL operated as an oscillator and an amplifier using variable parameter wigglers. (2) The FEL oscillator operated in conjunction with a storage ring using gain-expanded and phase area displacement wigglers. A summary and details of progress for the period October 1, 1982 - September 30, 1983 are presented. GRA

N84-18628# Boston Univ., Mass. Dept. of Chemistry.
PHOTODEGRADATION OF COUMARIN LASER DYES. AN UNEXPECTED SINGLET SELF-QUENCHING MECHANISM Technical Report, 1 Jan. - 31 Oct. 1982
Guilford Jones, II and William R. Bergmark 31 Oct. 1983 12 p Submitted for publication
(Contract N00014-79-C-0054; NR Proj. 395-609)
(AD-A136339; TR-4) Avail: NTIS HC A02/MF A01 CSCL 07/5

Photolysis of aminocoumarine laser dyes, including 7-diethylamino-4-methyl-coumarin has been investigated. Dealkylation of groups at the 7-dialkylamino functionality, reduction of the lactone moiety and overall photodecomposition of dyes have been observed. Concentration quenching of dye fluorescence is important at concentrations above 0.01 M. The photolysis is ascribed to singlet self quenching; triplet states are formed in low yield (flash photolysis) and are not reactive. Author (GRA)

N84-18629# Boston Univ., Mass. Dept. of Chemistry.
SOLVENT EFFECTS ON EMISSION YIELD AND LIFETIME FOR COUMARIN LASER DYES. REQUIREMENTS FOR A ROTATORY DECAY MECHANISM
Guilford Jones, II, William R. Jackson, Choi-yoo Choi, and William R. Bergmark (Ithaca Coll., N.Y.) 31 Oct. 1983 39 p Submitted for publication
(Contract N00014-79-C-0054; NR Proj. 395-609)
(AD-A136358; TR-5) Avail: NTIS HC A03/MF A01 CSCL 20/5

Photophysical parameters have been determined for coumarin laser dyes in organic solvents and water. Fluorescence yields and lifetimes were sensitive to solvent polarity depending on subtle features of dye structure. Protic solvents were important in reducing emission yield for certain dyes. Radiative and non-radiative rates were obtained and trends analyzed in terms of dye structure, solvent properties, and medium temperature. GRA

N84-18630# Boston Univ., Mass. Dept. of Chemistry.
PHOTOPHYSICAL AND PHOTOCHEMICAL PROPERTIES OF COUMARIN LASER DYES IN AMPHIPHILIC MEDIA
Guilford Jones, II, William R. Jackson, Santhi Kanoktanaporn, and William R. Bergmark (Ithaca Coll., N.Y.) 31 Oct. 1983 31 p Submitted for publication
(Contract N00014-79-C-0054; NR Proj. 395-609)
(AD-A136361; TR-6) Avail: NTIS HC A03/MF A01 CSCL 20/5

Photophysical properties of coumarin laser dyes solubilized in aqueous detergent or cyclodextrin solutions have been investigated. Dyes appear to be incorporated in hydrated (hydrogen bonded) sites within detergent micelles. Photodegradation is inhibited for detergent solubilized dye. Electron transfer photochemistry is examined by flash photolysis. GRA

N84-18631# Rochester Univ., N. Y.
THEORETICAL STUDY OF LASER-STIMULATED CHEMICAL VAPOR DEPOSITION PROCESSES OF IMPORTANCE IN MICROELECTRONICS Final Report, 1 Oct. 1982 - 31 Dec. 1983
Thomas F. George Dec. 1983 36 p
(Contract DAAG29-82-K-0196)
(AD-A136433; ARO-18570.15-EL) Avail: NTIS HC A03/MF A01 CSCL 07/5

Recent experiments have demonstrated that laser radiation incident on a gas surface interface can stimulate and control the process of vapor deposition onto the surface. This research project has been a theoretical analysis of the deposition and related laser-stimulated processes, with special attention given to the microscopic dynamics of energy flow associated with such processes. Author (GRA)

N84-18632# Rochester Univ., N. Y. Dept. of Chemistry.
LASER-INDUCED ELECTRON-PHONON PROCESSES ON METAL SURFACES
W. C. Murphy and T. F. George Dec. 1983 26 p
(Contract N00014-80-C-0472)
(AD-A136435; UROCHESTER/DC/83/TR-46) Avail: NTIS HC A03/MF A01 CSCL 07/5

Electronic charge transfer from bulk to surface states in metals induced by laser radiation is examined. Due to the position of the Fermi energy, it is necessary to also include phonon excitations. Cross sections for this second-order process are presented. Comparison with the surface excitation in semiconductors is made. It is seen that for metals the required laser frequencies are larger and the cross sections substantially less than for semiconductors. Author (GRA)

N84-18633# Rochester Univ., N. Y. Dept. of Chemistry.
LASER-INDUCED SURFACE MIGRATION VIA SURFACE PLASMONS
W. C. Murphy, X. Y. Huang, and T. F. George Dec. 1983 12 p
(Contract N00014-80-C-0472)
(AD-A136436; UROCHESTER/DC/83/TR-45) Avail: NTIS HC A02/MF A01 CSCL 07/5

A classical model coupling a charged adspecies to a laser-induced surface plasmon is presented. Such coupling can enhance the rate and specify the direction of surface migration. For the particular case of an atomic oxygen ion of charge -1 adsorbed on aluminum which is exposed to CO2 laser radiation of intensity 1 W/sq cu, the velocity of migration (61.3 micrometers/sec) is five orders of magnitude greater than the usual thermal velocities observed at room temperature. GRA

N84-18634# Stanford Univ., Calif.
INVESTIGATION OF OPTIMUM MAGNET GEOMETRIES FOR GAIN-EXPANDED FREE-ELECTRON LASERS Final Report, 15 Aug. 1981 - 31 Dec. 1982
A. L. Schawlow and J. M. Madey Nov. 1983 75 p
(Contract F49620-81-C-0098; AF Proj. 2301)
(AD-A136494; AFOSR-83-1255TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

The purpose of this research was the identification of the critical magnet and storage ring parameters for optimization of the efficiency, power output and gain of gain-expanded storage ring free electron lasers. While previous research had identified the basic properties of these devices, the approximations and simplifications employed in these efforts for solution of the equations of motion had led to some ambiguities which were not readily resolvable within the framework of the model employed. To resolve these ambiguities, a model was developed for the FEL wiggler magnet which permits an exact solution of the equations of motion. Using this model numerical techniques have been

employed to identify the dependence of the laser power output, gain, and efficiency on the magnet parameters. Author (GRA)

N84-18635# Army Missile Command, Redstone Arsenal, Ala. Directed Energy Directorate.
TRANSVERSE MODE FORMATION IN POSITIVE BRANCH UNSTABLE RESONATORS
R. William Jones Aug. 1983 125 p
(AD-A136515; AD-E950467; DRSMI/RH-83-4-TR) Avail: NTIS HC A06/MF A01 CSCL 20/5

The dynamics of transverse mode formation in positive branch unstable resonators with moderate magnification ($1.32 < M < 2.7$) and typical Fresenel numbers ($279 < NT < 10,800$) used in high energy lasers has been investigated. The objective was to observe the far-field intensity distribution from the onset of pumping to the steady-state diffraction limited pattern. The research consisted of experimental and numerical analyses. The experimental measurements of mode formation time were performed using a pulsed CO2 laser and a pulsed XeF laser. Mode formation was deduced from observation of the far-field. The analytical effort consisted of a Fast Fourier Transform (FFT) wave optics computation which modeled the far-field pattern evolution. Results agree with the temporal mode formation geometrical theory of Anan'ev when laser saturation is achieved at the predicted mode formation time in a CO2 laser. Rapid saturation at one-third this time results in significant earlier mode formation compared to the geometrical theory for a XeF laser. GRA

N84-18636# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
REPETITIVELY PULSED ELECTRIC LASER ACOUSTIC STUDIES, VOLUME 1 Final Technical Report, Jun. 1980 - Jun. 1983
K. U. Ingard and Charles F. McMillan Wright-Patterson AFB, Ohio AFWAL Sep. 1983 145 p 2 Vol.
(Contract F33615-80-C-2040; AF Proj. 2301)
(AD-A136538; AFWAL-TR-83-2058-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 20/5

This report summarizes a study of the acoustical characteristics of a closed loop duct system for pulsed lasers with emphasis on acoustic suppression technology. Several topics are considered involving wave propagation reflection and attenuation in a shock tube, in which pulse waves are generated, simulating those in a pulsed laser system. A detailed analysis of the design of parallel baffle attenuators for suppression of acoustic waves is given, allowing for the contributions of the reflection transmitted and reverberant contributions to the sound pressure field in the optical cavity. GRA

N84-18637# Hampton Inst., Va. Dept. of Physics and Engineering Studies.
AN INTENSE EXCITATION SOURCE FOR HIGH POWER (BLUE-GREEN) LASER Final Report, 25 Sep. 1980 - 10 Sep. 1983
K. S. Han 22 Nov. 1983 93 p
(Grants DAAG29-80-G-0014; DAAG29-81-G-0014)
(AD-A135873; ARO-17633.1-PH-H; ARO-18668.2-PH-H) Avail: NTIS HC A05/MF A01 CSCL 20/5

A high power blue-green dye laser has been pumped with an array of hypocyloidal-pinch (HCP) plasmas. The HCP pump source was energized by up to 4.2kJ energy stored in the capacitor bank. High pressure optical conversion. The maximum argon pressure used was 100 Torr with the optimum at 20 Torr. The rise time (approx. 1 micron) of pumping light is kept short by using a small (6 micron F) capacitance. The laser output power and energy dependence of the input electrical energy, the type of gas, the filling pressure and the laser cavity parameters were studied with respect to the characteristics of the pumping light. The plasma temperature 7,250 K was obtained when the HCP was operated for the optimum laser output. The spectral efficiency of the absorbed radiation at this temperature was 22% or 83% of the maximum efficiency of the optimum blackbody source. The author concluded that the HCP source has UV-rich spectrum, which can be varied to match the most efficient spectrum for laser pumping, and very high input capability. Thus it is suitable for repetitive and high average power laser systems. Author (GRA)

N84-18638# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
REANALYSIS METHODS FOR STRUCTURES WITH LASER INDUCED DAMAGE M.S. Thesis
Sheryl K. Bryan Mar. 1983 118 p
(AF Proj. 2401)
(AD-A135874; AFIT/GAE/AA/83M-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

A reanalysis method to analyze the strength of a structure which has encountered a laser strike is developed. The method accounts for the following types of laser induced damage: (1) loss of structure due to melting; (2) change of material properties due to temperature changes; and (3) addition of load due to thermal stress. The program uses heat balance calculations over successive finite time increments on an array of finite elements bisecting the laser beam spot to determine the temperature distribution. These results are then converted to structural stiffness parameters and the structural analysis is performed using a finite element based reanalysis method. The reanalysis method predicts the damage effects from the initial undamaged solution. The program was found to give good results consistent with results obtained from a separate analysis for each damage condition, but with less computer time and manhours. Author (GRA)

N84-18639# United Technologies Corp., East Hartford, Conn.
ENERGETICS AND COLLISION DYNAMICS OF ELECTRONIC TRANSITION LASERS Final Report, 1 Aug. 1981 - 31 Jul. 1983
H. H. Michels and R. H. Hobbs Oct. 1983 43 p
(Contract F49620-81-C-0097; AF Proj. 2303)
(AD-A135894; UTRC/R82-925832; AFOSR-83-1054TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

Quantum mechanical studies, including both ab initio configuration-interaction expansions and density functional calculations, have been carried out to examine the electronic structure, radiative lifetimes and collisional branching ratios for molecules of importance in studies of electronic transition lasers. These studies have included an analysis of the energetics of Mg/MgO excitation transfer reactions, the spectroscopy of the low-lying electronic states of the I2 and I3 molecules and the mechanisms of the I2/O2 1 Delta g dissociation kinetics. In addition, a study of the electronic structure of the NaMg system was carried out to evaluate its potential as a excimer laser. GRA

N84-18640# Western Research Corp., San Diego, Calif.
RADIATIVE COLLISIONAL LASER FEASIBILITY DEMONSTRATION Final Report, 16 Nov. 1981 - 15 Feb. 1983
K. Y. Tang, R. A. Tilton, W. E. Wells, Jr. (Miami Univ., Coral Gables), L. W. Downes (ARGO Research Corp.), and S. D. Marcum (ARGO Research Corp.) 7 Dec. 1983 58 p
(Contract N00014-82-C-0071)
(AD-A135793; WRC-713-R) Avail: NTIS HC A04/MF A01 CSCL 20/5

Collisional radiative process between metastable state He and ground state N2 has investigated through two separate experiments: gain/absorption in electron-beam excited He/N2 gas mixtures, and change of He metastable density in the presence of external photon flux. No net gain was observed in He/N2 system as it was presumably overwhelmed by the background absorption. However, the preliminary results of our He metastable density measurement gives strong evidence for existence of collisional radiative process. Author (GRA)

N84-18641# Rochester Univ., N. Y. Dept. of Chemistry.
LASER-INDUCED NEUTRALIZATION AND NEGATIVE-ION FORMATION IN SURFACE SCATTERING
Kai-Shu Lam, K. C. Liu, and Thomas F. George Dec. 1983 10 p Submitted for publication
(Contract N00014-80-C-0472; NR Proj. 056-749)
(AD-A135907; UROCHESTER/DC-83-TR-44) Avail: NTIS

HC A02/MF A01 CSCL 20/5

In neutralization and negative-ion formation from positive ions scattering from a solid surface, a laser can be used to control the nature of resonant, near-resonant, and even non-resonant transfer of electrons from the conduction band. These spectral characteristics can be achieved by variation of only the laser frequency and intensity. Author (GRA)

N84-18642# Science Applications, Inc., Boulder, Colo.
NONLINEAR ORBITS IN FREE-ELECTRON LASERS WITH A LINEAR MAGNETIC WIGGLER AND A STRONG AXIAL MAGNETIC GUIDE FIELD
B. Hafizi and R. E. Aamodt Oct. 1983 42 p
(Contract N00014-79-C-0555)
(AD-A135984; SAI-83-1124/PRI-66) Avail: NTIS
HC A03/MF A01 CSCL 20/8

Single particle trajectories in a free electron laser device consisting of a linear periodic wiggler superimposed on a strong uniform axial guide field are examined by a formalism suitable for perturbation analysis and adaptable to wigglers of arbitrary geometry. For motion locked on to a single resonance (between the gyromotion and the periodicity induced by the wiggler in the axial velocity) and for sufficiently weak wiggler fields, bounded oscillations of the gyroradius and axial velocity are possible for a limited region of parameter and phase space. Optimal parameters for which the largest fraction of particles entering the drift chamber experience limited excursions in gyroradius and in axial velocity are determined. The mean drift of the guiding center off axis is used to determine the allowable length of the wiggler and of the drift tube for beam propagation. With increasing wiggler field bounded motion is eliminated, leading to transition between resonances, chaotic motion and significant spread in axial velocities of electrons. Comparison with experimental results is presented.
Author (GRA)

N84-18643# Maryland Univ., College Park. Dept. of Electrical Engineering.
INVESTIGATION OF COLD CATHODE AND RF EXCITATION FOR LONG LIFE CO2 WAVEGUIDE LASERS Final Report, May 1982 - May 1983
U. Hochuli Mar. 1983 28 p Original contains color illustrations
(Contract N00014-79-C-0312; Grant AF-AFOSR-0058-82; AF Proj. 2303)
(AD-A136088; AFOSR-83-1134TR) Avail: NTIS
HC A03/MF A01 CSCL 20/5

Document describes a Ag-Li compound cathode for the longitudinally d.c. excited, low power, CO2 waveguide laser. Discharge tube results with this cathode produced an acceptable gas composition over a period of 1000 hours. The sputtering rate was quite low and, most importantly, the sputtering products did adhere quite well in the form of a thin film on the closest, cooler surfaces. A laser, using two of these cathodes, still produced 72% of its initial power output after 9200 hours of continuous service. Failure analysis indicated internal mirror damage on one of the mirrors, most likely due to improper selection of the dielectric top layer. Considerably more sputtering took place in the laser than in the discharge tube due to a laser cathode temperature that was too low. In parallel with these efforts we have started to investigate the life potential of the transversely R.F. excited waveguide laser. Preliminary results are quite encouraging. These tests were carried out over periods close to 3000 hours and indicate that proper selection of electrode materials is quite important. A wave guide laser with one of the waveguide sides made from a platinum alloy still yields 74% of its initial 2.85W after 5200 hours of continuous operations. GRA

N84-18644# Sverdrup Technology, Inc., Arnold Air Force Station, Tenn.
COLLISION WIDTHS OF CO LINES BROADENED BY WATER VAPOR AT ELEVATED TEMPERATURES Final Report, Jun. - Sep. 1982
R. E. Willis (Mercer Univ.), H. C. Walker, Jr., and H. S. Lowry, III (Calspan Field Services, Inc.) AEDC Nov. 1983 15 p Sponsored by Air Force
(AD-A136121; AEDC-TR-83-31) Avail: NTIS HC A02/MF A01 CSCL 21/5

A non-intrusive method of measuring concentration and temperature of specific molecules in the exhaust stream of rocket and turbine engines is being sought to replace the probe methods currently being used. The probe methods provide results which are subject to question as the probe itself may chemically alter the exhaust gas composition. The tunable diode laser (TDL) spectrometer system is being developed as a possible replacement for the probes. The TDL measurements can be made by passing the laser beam through the exhaust gases as they exit the engine. The energy absorbed from the laser beam is related to species concentration; i.e., the absorption is proportional to the number of absorbing molecules in the beam. The absorption also depends on wavenumber (line shape), as well as a line strength function which is temperature dependent. The line shape is affected by collisions with the absorbing molecules; therefore, the absorption is a function of the partial pressure of each gas present. Each gas present has a characteristic effect on the shape of the absorption line. In order to make accurate measurements, the instrument should be capable of recording true line shapes. GRA

N84-18645# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
DEVELOPMENT AND APPLICATIONS OF THE MICROCHANNEL SPATIAL LIGHT MODULATOR Final Report, 30 Sep. 1981 - 31 Dec. 1982
Cardinal Warde Washington AFOSR 30 Jun. 1983 69 p
(Grant AF-AFOSR-3328-77; AF Proj. 2305)
(AD-A136132; AFOSR-83-1107TR) Avail: NTIS
HC A04/MF A01 CSCL 20/5

The optically-addressed microchannel spatial light modulator (MSLM) is a versatile, real-time optical signal- and image-processing device that exhibits high optical sensitivity and high framing speed. It consists of a photocathode and a microchannel plate in proximity focus with an electro-optic crystal plate. A planar electron acceleration grid is often placed between the MCP and the electro-optic plate. The electro-optic plate carries a high-resistivity dielectric mirror on one side and a transparent conducting electrode on the other. The fundamental operating characteristics and materials limitations of the device are discussed. The role of secondary electron emission in the operation of the device is stressed and some of the write, cycling, and readout modes and their limitations are described. In addition, the limitations of the inherent space-domain image-processing operations of the device are discussed. In the final section, the report summarizes some of the key results on the application of the MSLM to the problem of high resolution, all-optical, adaptive wavefront phase compensation for communication and imaging through the Earth's atmosphere. Author (GRA)

N84-18646# Columbia Univ., New York. Dept. of Chemistry.
PICOSECOND LASER STUDIES OF EXCITED STATE PROCESSES Final Technical Report, 1 Oct. 1980 - 30 Sep. 1983
K. B. Eisenthal 15 Nov. 1983 10 p
(Grant AF-AFOSR-0009-81; AF Proj. 2303)
(AD-A136137; AFOSR-83-1096TR) Avail: NTIS
HC A02/MF A01 CSCL 07/4

Progress is reported in studies of key chemical and physical processes by which molecules in excited electronic states dissipate their excess energy. Many of these energy relaxing mechanisms and related molecular motions are so extremely rapid, especially in liquids, that they require special techniques for their study. To this end sophisticated picosecond laser systems were constructed which enable detection of transient absorption, emission and scattering events on the picosecond time scale. Spectroscopic methods are used to address two important classes of chemical problems. One is the key role played by excited state intramolecular charge transfer processes in opening up new pathways for chemical change, energy transfer and decay in molecular systems. The second area is aimed at the key aspect of chemical reactions, namely the identification and study of the

properties of the short-lived chemical intermediates occurring in chemical reactions. GRA

N84-18647# Los Alamos Scientific Lab., N. Mex. Chemistry Div.
PROSPECTS FOR SINGLE-MOLECULE DETECTION IN LIQUIDS BY LASER-INDUCED FLUORESCENCE
Mitchell Trkula, Richard A. Keller, John C. Martin, James H. Jett, and Norman J. Dovichi (Wyoming Univ.) 1983 4 p refs Presented at the 26th ORNL-DOE Conf. on Anal. Chem. in Energy Technol., Knoxville, Tenn., 11 Oct. 1983
(Contract W-7405-eng-36)
(DE84-001702; LA-UR-83-3010; CONF-831025-16) Avail: NTIS HC A02/MF A01

A laser induced fluorescence determination of aqueous solutions of rhodamine 6G which resulted in a detection limit of 18 attograms, or 22,000 molecules, of rhodamine 6G is discussed. These results allow the projection to single molecule detection with reasonable improvements in the experimental apparatus.DOE

N84-18648# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
LASER RANGE FINDING TECHNOLOGY FOR SPACE TO SPACE APPLICATIONS. VOLUME 1: LASER DIODE RANGE FINDER FUNCTIONAL MODEL Final Report
K. Bothmann, H. Fischer, B. Kunkel, J. Luther, S. Manhart, G. Sepp, D. Siemen, and M. Wuermseer Paris ESA Jun. 1983 240 p refs Original contains color illustrations
(Contracts ESTEC-4681/81/NL-HP(SC); MBB-R-3700/2642R)
(MBB-UR-608-83-O-Vol-1; ESA-CR(P)-1783) Avail: NTIS HC A11/MF A01

A functional model of a combination of two laser diode transmitter and receiver systems with a common receiver optics, consisting of a pulsed laser diode system for rapid acquisition and tracking of targets in a relatively large search area and a small window including coarse range determination by time-of-flight measurement; and a continuous wave laser diode transceiver for precision tracking and ranging of one target by phase comparison between a carrier frequency and the modulated return signal was developed. Search and acquisition of moving reflector targets within a total search field-of-view (FOV) 30 x 30 deg; space-to-space range = 10 km; small-angle tracking and ranging is within 2 x 2 deg FOV; acquisition/frame time = 20 sec; range resolution is < or = 10 cm far field, < or = 1 cm near field (up to 500 m). Author (ESA)

N84-18649# National Bureau of Standards, Washington, D.C.
PROCEEDINGS OF A SYMPOSIUM ON LASER INDUCED DAMAGE IN OPTICAL MATERIALS: 1981 Final Report
Harold E. Bennett, ed. (Naval Weapons Center), Arthur H. Guenther, ed. (AFWL), David Milam, ed. (LLNL), and Brian E. Newman, ed. (LASL) Sep. 1983 654 p refs Symposium held at Boulder, Colo., 17-18 Nov. 1981 Sponsored in part by American Society for Testing Materials, Office of Naval Research, DOE, DARPA and AFOSR
(PB84-127869; NBS/SP-638; LC-83-600570) Avail: NTIS HC A99/MF A01 CSCL 20E

The symposium was divided into sessions concerning Materials and Measurements, Mirrors and Surfaces, Thin Films, and finally Fundamental Mechanisms. As in previous years, the emphasis of the papers presented at the Symposium was directed toward new frontiers and new developments. Particular emphasis was given to materials for high power apparatus. The wavelength range of prime interest was from 10.6 micrometers to the UV region. Highlights included surface characterization, thin film substrate boundaries, and advances in fundamental laser matter threshold interactions and mechanisms. The scaling of damage thresholds with pulse duration, focal area, and wavelength was discussed in detail. GRA

N84-18452# TRUMPF G.m.b.H. und Co., Ditzingen (West Germany). Sales and Application Technique.
LASER CUTTING: AN ADVANCED TECHNOLOGY IN SHEET METAL WORKING
E. O. Herb *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 8 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-18650 United Kingdom Atomic Energy Authority, London (England).
METALLURGICAL ASPECTS AND MECHANICAL PROPERTIES OF WELD METAL IN AUTOMATIC SUBMERGED ARC WELDING
L. Devillers, B. Marandet, D. Kaplan, A. Ribes, and P. V. Riboud 1983 31 p refs Transl. into ENGLISH from Soudage et Tech. Connexes (France), v. 37, no. 7/8, Sep. - Oct. 1983 p 229-239 (BLL-Risley-Tr-4875-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

In the case of high-energy welding, special precautions must be taken to impart sufficient toughness to the weld metal. The automatic submerged arc welding of a solid flux of considerable dulution (60% to 70%) structural steel microalloyed with niobium was discussed. The nature of oxide inclusions and their effect on microstructure and mechanical properties, and the effect of other elements on weld metal toughness were investigated. Results show that in the case of high energy submerged arc welding of structural steels, the toughness of the weld zone depends on the inclusion of various physicochemical aspects of its transformation. This is because the precise deoxidation and possibly desulphurization conditions of the liquid metal determine the inclusionary state of the weld metal. This inclusionary state effects the gamma - alpha transformation and hence the microstructure and toughness of the weld zone. A.R.H.

N84-18651 British Library Lending Div., Boston Spa (England).
OPTIMIZATION OF PARAMETERS OF ELECTROMECHANICAL SYSTEMS WITH MECHANICAL BALANCING
V. F. Egorov (Siberian Metallurgical Inst.), Sh. V. Khamitsev (Siberian Metallurgical Inst.), G. B. Trushevich (Siberian Metallurgical Inst.), and V. I. Lyulenkov (Siberian Metallurgical Inst.) [1983] 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb, Zaved. Chern. Met. (USSR), no. 4, 1983 p 126-129
(BLL-M-35442) Avail: British Library Lending Div., Boston Spa, Engl.

Questions of selecting the optimum parameters of the counterbalance and the initial position of the lever in lever-operated mechanical balancing systems are examined according to the criterion of minimization of electrical losses in the motor. The obtained relations are used both for designing new balancing systems, and for reconstructing existing systems. Author

N84-18652 British Library Lending Div., Boston Spa (England).
MOVEMENT OF FREE-FLOWING MATERIALS IN AERODYNAMIC CONTROLLED-FEED GATE
A. B. Talzhanov, E. V. Maksimov, B. S. Fialkov, B. S. Fialkov, and T. E. Zhandildin [1983] 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 4, 1983 p 129-132
Avail: British Library Lending Div., Boston Spa, Engl.

An account is given of experimental modelling of an aerodynamic controlled feed gate intended for stable and controlled delivery of the free-flowing products of thermochemical treatment. The influence of the parameters of the gas stream on the velocity of discharge of free-flowing material was established. Author

N84-18653*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MECHANISM OF LUBRICATION BY TRICRESYLPHOSPHATE (TCP)

Owen D. Faut (Wilkes Coll., Wilkes-Barre, Pa.) and Donald H. Buckley Feb. 1984 13 p refs
(NASA-TP-2274; E-1846; NAS 1.60:2274) Avail: NTIS HC A02/MF A01 CSCL 11H

The coefficient of friction was measured as a function of temperature on a pin-on-disk tribometer. Pins and disks of 440C and 52100 steels were lubricated with tricresylphosphate (TCP), 3.45 percent TCP in squalene, and pure squalene. The M-50 pins and disks were lubricated with 3.45 percent TCP in squalene and pure squalene. Experiments were conducted under limited lubrication conditions in dry (< 100 ppm H2O) air and dry (< pp H2O) nitrogen at 50 rpm (equivalent to a sliding velocity of 13 cm sec) and a constant load of 9.8 N (1 kg). Characteristic temperatures T sub r were identified for TCP on 52100 steel and for squalene on M-50 and 52100 steels, where the friction decreased because of a chemical reaction between the lubricant and the metal surface. The behavior of squalene obscured the influence of 3.45 percent TCP solute on the friction of the system. Wear volume measurements demonstrated that wear was lowest at temperatures just above T sub r. Comparing the behavior of TCP on M-50, 440C, and 52100 steels revealed that the TCP either reacted to give T sub r behavior or produced initial failure in the temperature range 223 + or - 5 C. S.L.

N84-18654*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF PREDICTED AND EXPERIMENTAL THERMAL PERFORMANCE OF ANGULAR-CONTACT BALL BEARINGS
Richard J. Parker Feb. 1984 19 p refs
(NASA-TP-2275; E-1751; NAS 1.60:2275) Avail: NTIS HC A02/MF A01 CSCL 13I

Predicted bearing heat generation and bearing temperature were verified by experimental data for ball bearings over a range of sizes, shaft speeds, and lubricant flow rates. The computer program Shaberth requires, as input, a factor which describes the air-oil mixture in the bearing cavity for calculation of the ball drag contribution to bearing heat generation. An equation for this lubricant percent volume in the bearing cavity was derived and appears to be valid over the range of test conditions including bearing bore sizes from 35 to 167 mm and shaft speeds from 1.0 to 3.0 million DN. Author

N84-18655# Southwest Research Inst., San Antonio, Tex.
ENGINE-TRANSMISSION ANGULAR-CONTACT BALL THRUST BEARING ENDURANCE TESTS Final Report
B. B. Baber Nov. 1983 12 p
(Contract DLA900-79-C-1266)
(AD-A136264; SWRI-15-5607-814) Avail: NTIS HC A02/MF A01 CSCL 13/9

Six bearings were endurance tested in pairs in a machine utilizing back-to-back loading of the bearing pairs. Each pair of bearings were run using a predetermined speed and load test schedule for 1,000 hours or failure, whichever occurred first. A description of the test program and the results obtained are described. GRA

N84-18656# Naval Postgraduate School, Monterey, Calif.
DESIGN OPTIMIZATION OF MARINE REDUCTION GEARS M.S. Thesis
William T. Bramlett, II Sep. 1983 106 p
(AD-A136352) Avail: NTIS HC A06/MF A01 CSCL 13/9

The development and use of the FORTRAN program MARGO (Marine Reduction Gear Optimization) is described. MARGO performs design analysis, weight minimization, and a rudimentary form of noise minimization using the general purpose optimization program called ADS-1 (Automated Design Synthesis, Version 1). Numerous subroutines are presented which calculate the associated design variables for marine reduction gears. The entire program is self-documented and easily modified by the user. Examples are presented to demonstrate the utility of the program. Author (GRA)

N84-18657# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS IN THE DEVELOPMENT OF HIGH-POWER TURBOGENERATORS WITH SUPERCONDUCTING FIELD WINDINGS
G. G. Borzov, I. A. Glebov, L. P. Gnedin, V. V. Dombrovskiy, V. G. Novitskiy, and V. N. Shakhtarin 5 Dec. 1983 25 p Transl. into ENGLISH from Energetika i Transport (USSR), no. 4, Jun. - Aug. 1972 p 21-28
(AD-A136525; AD-F300360; FTD-ID(RS)T-1310-83) Avail: NTIS HC A02/MF A01 CSCL 10/2

The advantages of cryoturbogenerators in comparison with turbogenerators of ordinary use are stated, the structural elements of powerful cryoturbogenerators are described and the results of model tests are presented. Scientific problems are formulated, which must be solved during the development of powerful turbogenerators. GRA

N84-18658# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
DRIVING TRACTION ON ICE WITH ALL-SEASON AND MUD-AND-SNOW RADIAL TIRES
G. L. Blaisdell Nov. 1983 29 p
(DA Proj. 4A7-62730-AT-42)
(AD-A136115; CRREL-83-27) Avail: NTIS HC A03/MF A01 CSCL 13/6

This study reports on a comparison of the driving traction performance on ice of a selected group of all-season radial tires with mud-and-snow radial tires. In addition to performance variation due to tread design, the effects of tire inflation pressure and ice temperature are explored. The results indicate that no significant tractive advantage on ice can be attributed to tread design. The contribution of tire tread to traction on ice is completely overshadowed by adhesion between the ice and the compound which makes up the tire's contact surface. Based on adhesion, a slight favoring of all-season tires is found. Increasing ice temperature generally decreased the tractive capability of a specific tire. For several tires, however, the opposite was true. Reduced inflation pressure also caused a slight decrease in the tractive performance parameters calculated. Author (GRA)

N84-18659# Department of Energy, Bartlesville, Okla.
EMISSIONS AND EFFICIENCY OF AGRICULTURAL DIESELS USING LOW-PROOF ETHANOL AS SUPPLEMENT FUEL
J. R. Allsup and J. M. Clingenpeel Jan. 1984 26 p refs
(DE84-003931; DOE/BETC/RI-83/12) Avail: NTIS HC A03/MF A01

The potential of using low proof ethanol to supplement diesel fuel in agricultural engines was evaluated. Fumigation, mechanical emulsification, and chemical emulsifiers were used to introduce a significant amount of alcohol with diesel fuel for engine operation. A total of five diesel tractor engines were tested using each of the fuel systems. Exhaust products and fuel usage are determined at various engine speed/load conditions. DOE

N84-18660# Department of Energy, Washington, D. C. Office of Vehicle and Engine Research and Development.
REPORT TO CONGRESS ON THE AUTOMOTIVE TECHNOLOGY DEVELOPMENT PROGRAM Annual Progress Report
Dec. 1983 22 p
(DE84-004097; DOE/CE-0027/2; AR-5) Avail: NTIS HC A02/MF A01

The status of conventional powertrain technology and R and D projects that address the high risk areas associated with the gas turbine engines, Stirling engine, heavy duty transport technology, and ceramic materials technology development is reported. DOE

N84-18661# Mechanical Technology, Inc., Latham, N. Y.
FREE-PISTON STIRLING ENGINE EXPERIMENTAL PROGRAM: PART 2. AN EVALUATION OF LOSS MECHANISMS
T. Moynihan, R. Berggren, and G. Dochat Jun. 1983 189 p refs
(Contract W-31-109-eng-38)
(DE84-003658; ANL-CT-83-7-PT-2) Avail: NTIS

HC A09/MF A01

Experiments in which measurements were taken on a free Stirling engine to isolate effects believed to degrade engine performance are described. The effects examined are: compression/space hysteresis, regenerator losses, displacer seal clearance loss, and displacer appendix gap loss. The most significant effect was the clearance between the displacer and cylinder wall. Best performance was attained by a close clearance seal of 2 mils. Greater clearances or use of a piston ring degraded performance. It is found that overall efficiency of the engine is raised several points due to this finding. Author

N84-18662# San Fernando Labs., Pacoima, Calif.
FABRICATION AND COATING OF SELECTED DIESEL ENGINE COMPONENTS FOR COMBUSTION DURABILITY TESTING Final Technical Report
Jacob J. Stiglich, Jr. Sep. 1983 76 p refs
(Contract DE-AC06-76RL-01830)
(DE84-002188; DOE/RL-01830/T11) Avail: NTIS HC A05/MF A01

The fabrication of coated ceramic components for testing in advanced diesel engines is described. Slip cast and sintered mullite and zirconia parts for valves and pistons were developed. Thermal expansion properties of various zirconia compositions were measured. The SiC coating techniques for materials were developed. In addition, hard/erosion resistant coatings were applied to fuel injector parts. The brazing techniques for attachment of ceramic parts to valves and pistons are developed. DOE

N84-18663# Bureau of Mines, Rolla, Mo.
GENERATION, COLLECTION, AND ANALYSIS OF WELDING FUMES
J. F. McIlwain and L. A. Neumeier Sep. 1983 21 p refs
(PB84-116607; BM-RI-8793; LC-83-10128) Avail: NTIS HC A02/MF A01 CSCL 14B

Fumes generated by selected welding materials used in mines in order to help determine their relative hazard potential are investigated. A welding-fume generation and collection apparatus was designed, and AWS-type E308-16 stainless steel electrodes were tested. Total fume generation rates of 0.39 to 0.51 g/min were measured. Quantitative chemical analyses were conducted for all of the principal fume constituents. Two analytical schemes were used to determine levels of the Cr(+6) and Cr(+3) species contained in the welding fumes, comparable results were obtained. The Cr(+6) was found to be the most hazardous constituent, leading to a maximum allowable total fume exposure of 1 mg/cu m. Fume generation rates and fume constituent analyses will be derived for other groups of welding electrodes using similar procedures. Author

N84-18664# Adaptive Technologies, Inc., Sacramento, Calif.
DIGITALLY-CONTROLLED ADAPTIVE WELDING SYSTEM
W. J. Kerth, Sr. and W. J. Kerth, Jr. 22 Jul. 1983 37 p refs
(Grant NSF MEA-81-14378)
(PB84-125285; NSF/MEA-83008) Avail: NTIS HC A03/MF A01 CSCL 13H

Results are presented of research which focused on the following areas: (1) complex part adaptive welding using flux cored arc welding; (2) controlled starts and stops with adaptive welding using the gas tungsten and welding process; and (3) multipass adaptive welding using the flux cored arc and gas tungsten arc processes. Two types of experimental systems developed during the course of the research are discussed: a mobile adaptive system and a five part robot welding cell for fully automatic complex part welding. The adaptive welding system's architecture and the hierarchically structured computer control system are examined. Models developed for welding applications are considered, including V-butt joints, square butt joints, tacks, and three dimensional, contoured butt joints. GRA

N84-18436# Projects Expedited (Proprietary) Ltd. (South Africa).
FRICTION WELDING
G. B. Murray *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 14 p refs (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

N84-18437# Emaillit-Proderite Cape (Proprietary) Ltd. (South Africa). PVC Div.
WELDING OF THERMOPLASTICS
A. Chalef *In* CSIR Mini-Seminar on Joining Tech. Aug. 1982 12 p (For primary document see N84-18431 09-31)
Avail: NTIS HC A05/MF A01

N84-18445# South African Inst. for Production Engineering, Pretoria.
COLD FORMING AND UPSETTING IN THE FASTENER INDUSTRY
A. R. Wiggins *In its* Fourth Seminar on Efficient Metal Forming and Machining 1982 8 p (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

N84-18450# South African Inst. for Production Engineering, Pretoria. Manufacturing Systems.
BROACHING TODAY
A. C. Turner *In its* Fourth Seminar on Efficient Metal Forming and Machining 1982 9 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

N84-18451# Gleason Works, Rochester, N.Y. Machine Div.
ADVANCED FINISHING METHODS FOR SPIRAL BEVEL AND HYPOID GEARS
W. R. McVea *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 15 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

N84-18453# National Physical Lab., Teddington (England).
FUNDAMENTAL APPROACH TO DESIGN AND PREDICTION OF PERFORMANCE OF FORMING TOOLS
E. A. Almond and M. G. Gee *In* South African Inst. for Production Engineering Fourth Seminar on Efficient Metal Forming and Machining 1982 16 p refs (For primary document see N84-18438 09-31)
Avail: NTIS HC A11/MF A01

N84-18458# Contraves Corp., Zurich (Switzerland). Dept. EKR.
SPACE TELESCOPE: SOLAR ARRAY PRIMARY DEVELOPMENT MECHANISM
A. Veit and D. Chandler *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 27-34 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18459# European Space Research and Technology Center, Noordwijk (Netherlands).
THE GIOTTO MECHANISMS AND THEIR FUNCTIONS
F. Felici *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 37-45 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18465# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
THE STIFFNESS TORQUE AND THERMAL CONDUCTANCE OF THIN-SECTOR FOUR-POINT CONTACT BALL BEARINGS FOR USE IN SPACECRAFT MECHANISMS
R. A. Rowntree *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 91-100 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18466# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
COMPUTATIONAL METHODS FOR BALL BEARINGS IN SPACECRAFT

M. J. Todd *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 101-108 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18467# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
SOME OBSERVATIONS ON THE PERFORMANCE OF FOMBLIN Z25 OIL AND BRAYCOTE 3L-38RP GREASE IN BALL BEARINGS AND GEAR BOXES
K. T. Stevens *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 109-117 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18469# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).
LUBRICATION OF MOUNTINGS SUBJECT TO CONTACT CORROSION
M. Maillat, H. Boving, and H. E. Hintermann *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 125-129 refs In FRENCH (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18470# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
THE TRIBOLOGY OF GEARS FOR SATELLITE APPLICATIONS
K. I. Stevens *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 131-146 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18473# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
COMPUTERISED DATA ACQUISITION AND CONTROL METHODS AS RELATED TO MECHANISMS TESTING
S. G. Bamford *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 167-175 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18474# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
MAGNETIC BEARING DESIGN FOR HIGH SPEED MOMENTUM WHEELS
Th. Lange *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 179-185 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18475# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
BAE REACTION WHEELS FOR OLYMPUS
G. J. Sturtivant *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 187-192 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF/ A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-18665# University Coll., London (England). Dept. of Electronic and Electrical Engineering.
REFLECTION ACOUSTIC MICROSCOPY FOR MICRO-NDE Final Technical Report, Jan. 1979 - Mar. 1982
Mehrdad Nikoonahad Feb. 1983 160 p
(Grant DA-ERO-79-G-0011; DA Proj. 1T1-61102-BH-57)
(AD-A136321) Avail: NTIS HC A08/MF A01 CSCL 20/6

The reflection acoustic microscope has evolved to a stage where it can be regarded as a powerful laboratory tool for an important class of problems in non destructive examination. The report is concerned with an extension of the capability of the acoustic microscope for such applications. Acoustic microscopy involves imaging in highly attenuating media. There has for long been a controversy on whether the losses enhance or degrade the resolution of the microscope. The author has developed a novel analytical technique - an extension of Fourier optics - for analyzing this problem. Results obtained show that with losses: (1) The resolution deteriorates; (2) The sidelobe levels at the focal plane are reduced; and (3) The depth of focus of the lens is reduced. GRA

N84-18666# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
METALLURGICAL AND MECHANICAL TESTS OF MATERIALS Final Report
20 Dec. 1983 21 p Revised
(AD-A136347; TOP-3-2-806) Avail: NTIS HC A02/MF A01 CSCL 14/2

Describes methods of evaluating the physical properties of components and causes of failures. Describes equipment required and procedures for chemical analysis (wet method, spectrographic, and X-ray emission spectrographic analysis); macroscopic examination (gross structure and fracture area); microscopic examination; and mechanical testing including tension tests, hardness tests (Rockwell, Brinell, Knoop, scleroscope, and Vickers), notched bar impact tests (Charpy and Izod), fracture toughness tests, and fatigue tests. Author (GRA)

N84-18667# Ohio State Univ., Columbus. Dept. of Preventive Medicine.
EFFECTS OF ASSUMING INDEPENDENT COMPONENT FAILURE TIMES, IF THEY ARE ACTUALLY DEPENDENT, IN A SERIES SYSTEM Annual Report, 1 Sep. 1982 - 30 Sep. 1983
Melvin L. Moeschberger and John P. Klein 26 Oct. 1983 91 p
(Grant AF-AFOSR-0307-82; AF Proj. 2304)
(AD-A136567; AFOSR-83-1278TR) Avail: NTIS HC A05/MF A01 CSCL 12/1

The overall objective of this proposal is to investigate the robustness to departures from independence of methods currently in use in reliability studies when competing failure modes or competing causes of failure associated with a single mode are present in a series system. The first specific aim is to examine the error one makes in modeling a series system by a model which assumes statistically independent component lifetimes when in fact the component lifetimes follow some multivariate distribution. The second specific aim is to assess the effects of the independence assumption on the error in estimating component parameters from life tests on series systems. In both cases, estimates of such errors will be determined via mathematical analysis. A graphical display of the errors for representative distributions will be made available to researchers who wish to assess the possible erroneous assumption of independent competing risks. A third aim is to tighten the bounds on estimates of component reliability when the risks belong to a general dependence class of distributions (for example, positive quadrant dependence, positive regression dependence, etc.). Major decisions involving reliability studies, based on competing risk methodology, have been made in the past and will continue to be made in the future. This study will provide the user of such techniques with a clearer understanding of the robustness of the analyses to departures from independent risks, an assumption commonly made by the methods currently in use. Author (GRA)

N84-18668# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
DIRECT AND INVERSE DIFFRACTION PROBLEMS FOR QNDE (QUANTITATIVE NON-DESTRUCTIVE EVALUATION) APPLICATIONS Final Report, 1980 - 1983
J. D. Achenbach Oct. 1983 12 p
(Grant DAAG29-80-C-0086)

(AD-A135838; ARO-16803.6-EG) Avail: NTIS HC A02/MF A01 CSCL 20/1

A summary and a bibliography are presented of investigations on the direct and inverse diffraction problems for the interaction of ultrasonic waves with flaws. These investigations were carried out with a view towards applications in qualitative non-destructive evaluation (QNDE). Author (GRA)

N84-18669# IIT Research Inst., Chicago, Ill.
RELIABILITY MODELING OF CRITICAL ELECTRONIC DEVICES Final Technical Report, Oct. 1981 - Jan. 1983
David W. Coit and Joseph J. Steinkirchner Griffiss AFB, N.Y. RADC May 1983 374 p
(Contract F30602-81-C-0236; AF Proj. 2338)
(AD-A135705; RADC-TR-83-108) Avail: NTIS HC A16/MF A01 CSCL 14/4

This report presents failure rate prediction procedures for magnetrons, vidicons, cathode ray tubes, semiconductor lasers, helium-cadmium lasers, helium-neon lasers, Nd:YAG lasers, electronic filters, solid state relays, time delay relays (electronic hybrid), circuit breakers, I.C. Sockets, thumbwheel switches, electromagnetic meters, fuses, crystals, incandescent lamps, neon glow lamps and surface acoustic wave devices. Collected field failure rate data were utilized to develop and evaluate the procedures. The reliability prediction procedures are presented in a form compatible with MIL-HDBK-217. Author (GRA)

N84-18670# Argonne National Lab., Ill. Materials Science and Technology Div.
ACOUSTIC LEAK DETECTION AND ULTRASONIC CRACK DETECTION
D. S. Kupperman, T. N. Claytor, and R. Groenwald (GARD, Inc.) Oct. 1983 22 p refs Presented at the 11th NRC Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 24-28 Oct. 1983 Sponsored in part by the Nuclear Regulatory Commission
(Contract W-31-109-eng-38)
(DE84-004037; CONF-8310143-67) Avail: NTIS HC A02/MF A01

The effectiveness of current and proposed techniques for acoustic leak detection (ALD) in reactor coolant systems was addressed. An ALD facility was constructed and tests have begun on five laboratory grown cracks (three fatigue and two thermal fatigue and two field induced IGSCC specimens. Data from HATCH-1 indicate the background noise level at a BWR recirculation header sweepolet weld. The HATCH leak detection system was tested to determine the sensitivity and dynamic range. An ANL waveguide system, including transducer and electronics, was tested on an accumulator safety injection pipe. The possibility of using ultrasonic wave scattering patterns to discriminate between IGSCCs and geometric reflectors was explored. Thirteen reflectors were examined. Work with cast stainless steel (SS) included sound velocity and attenuation in isotropic and anisotropic cast SS. Reducing anisotropy does not help reduce attenuation in large grained material. Large artificial flaws is not detected in isotropic centrifugally cast SS by longitudinal or shear waves at frequencies of 1 MHz or greater, but is detected with 0.5-MHz shear waves. DOE

N84-18463# Societe Nationale Industrielle Aerospatiale, Cannes (France).
FAILURE MODE PREDICTION ANALYSIS USING THE RELIABILITY INFORMATION SOFTWARE (RIF) [L'ANALYSE PREVISIONELLE DES MODES DE DEFAILLANCE A L'AIDE D'UN PROGICIEL DENOMME SYSTEME D'INFORMATIONS FIABILITE]
T. deMollerat and J. P. Courtin (Societe d'Etudes des Systemes d'Automation) *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 73-77 In FRENCH (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18472# United Kingdom Atomic Energy Authority, Risley (England). European Space Tribology Lab.
ACHIEVEMENT OF RELIABILITY BY THERMAL VACUUM TESTING OF SPACECRAFT MECHANISMS
K. Parker and J. A. Duvall *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 157-165 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N84-18671 British Library Lending Div., Boston Spa (England).
PHOTOELASTIC ANALYSIS OF DIRECT SHEAR TESTS FOR GRANULAR MATERIALS
Edward Glaska, Jacek Borysow, and Andrzej Drescher 3 Jan. 1984 14 p refs Transl. into ENGLISH from Arch. Hydrotech. (Poland), v. 28, no. 4, 1981 p 625-638
(BLL-M-28752-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Tests performed in a direct shear box on an optically sensitive model granular material consisting of particles of crushed glass are described. The use of polarized light allows determination of principle stress trajectories inside the mass of particles, and on the shear plane in particular. The corresponding displacement increments field was measured by stereophotogrammetry. Test results were compared with theoretical solutions based on rigid-plastic and elastic models for the sheared material. It is shown that close agreement is obtained when plastic solution or classical Coulomb's sliding hypothesis is assumed. E.A.K.

N84-18672 British Library Lending Div., Boston Spa (England).
NUMERICAL INVESTIGATION OF STRESS-STRAIN STATE OF COMPOSITE WORKING TOOL ASSEMBLED WITH NEGATIVE ALLOWANCE
V. P. Polukhin, N. F. Andrianov, A. V. Novikov, and E. V. Popova [1983] 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR), no. 3, 1983 p 47-50
(BLL-M-35379) Avail: British Library Lending Div., Boston Spa, Engl.

On the basis of the potential method, a procedure is developed for investigation of the contract stresses and determination of the three dimensional stress state in a composite working tool (sleeved rolls and composite draw plates and containers) assembled with negative allowance with elements of different elasticity. Author

N84-18673 Defence Research Information Centre, Orpington (England).
THE MECHANOLUMINESCENCE OF FIBREGLASS TUBES IN THE PLANE STRESSED STATE
Z. T. Upitis, U. E. Krauya, and Y. L. Yanson Aug. 1983 13 p refs Transl. into ENGLISH from Mekh. Kompozitnykh Mater. (USSR), No. 3, 1980 p 552-556
(DRIC-T-7014; BR89832) Copyright. Avail: Issuing Activity

The mechanoluminescence produced by plane stressed cylindrical glass fiber tubes was investigated. Methods for recording the photon emission were developed. The forces acting on the tubes were measured. The elastic and strength properties of the fiberglass were studied and their influence on the emission was observed. Author (ESA)

N84-18674# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
INTERACTION BETWEEN LOCAL AND OVERALL BUCKLING MODES IN AXIALLY STIFFENED CYLINDRICAL SHELLS Ph.D. Thesis
David Hui Nov. 1983 155 p refs Sponsored by Natural Sciences and Engineering Research Council of Canada
(UTIAS-247; ISSN-0082-5255) Avail: NTIS HC A08/MF A01

The effect of stringer cross-sectional area, torsional rigidity

and eccentricity on panel initial post-buckling behavior and mode interaction for axially stiffened cylindrical shells is discussed. As far as the local panel modes are concerned, the cylinder is taken to be integrally stiffened and post-buckling redistribution of the axial load carrying capacity between skin and stringers is investigated. It is found that, although the local buckling analysis is more or less identical to that of Stephens, there are significant changes in the quartic term of the potential energy and hence, the imperfection sensitivity of the structure is altered. These changes are due to the interaction between the stringers and the skin in the post-buckling analysis of the local mode. In addition, in order to assess the effect of the nonlinear prebuckling state due to the presence of local imperfections, Koiter's theory of amplitude modulation of the local mode is applied to mode interaction example problems of interest. S.L.

N84-18675*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL EFFICIENCY STUDIES OF CORRUGATED COMPRESSION PANELS WITH CURVED CAPS AND BEADED WEBS
Randall C. Davis, Charles T. Mills (Old Dominion Univ.), R. Prabhakaran (Old Dominion Univ.), and L. Robert Jackson Feb. 1984 26 p refs
(NASA-TP-2272; L-15703; NAS 1.60:2272) Avail: NTIS HC A03/MF A01 CSCL 20K

Curved cross-sectional elements are employed in structural concepts for minimum-mass compression panels. Corrugated panel concepts with curved caps and beaded webs are optimized by using a nonlinear mathematical programming procedure and a rigorous buckling analysis. These panel geometries are shown to have superior structural efficiencies compared with known concepts published in the literature. Fabrication of these efficient corrugation concepts became possible by advances made in the art of superplastically forming of metals. Results of the mass optimization studies of the concepts are presented as structural efficiency charts for axial compression. Author

N84-18676# Aeronautical Research Labs., Melbourne (Australia).
THE USE OF INTERFERENCE-FIT BOLTS OR BUSHES AND HOLE COLD EXPANSION FOR INCREASING THE FATIGUE LIFE OF THICK-SECTION ALUMINIUM ALLOY BOLTED JOINTS
J. Y. Mann, A. S. Machin, W. F. Lupson, and R. A. Pell Aug. 1983 56 p refs
(AR-002-973; ARL-Struc-Note-490) Avail: NTIS HC A04/MF A01

Bolt holes were detected in the lower front flange of the main spar os the mirage 3 wing, so fight-by-flight fatigue test were conducted to determine the relative fatigue performance of aluminum aloy bolted joint specimens with various bolts and bushes. Compared with joints assembled with close-fit bolts in reamed holes, the ratios of lives of specimens incorporating interference-fit bolts, interference-fit bushes and cold expanded bolt holes were about 9:1, 5:1, and 3:1, respectively. Specimens with holes cold expanded followed by the installation of interference-fit brushes results in greater fatigue life with interference-fit bushes alone. It is concluded that if refurbishment requirement for the flange involves the enlargement of bolt holes to remove fatigue cracks and also the subsequent periodic nondestructive inspection of holes in service, the use of interference-fit bushes either alone or in combination with hole cole expanded should enable a satisfactory extension in fatigue life. A.R.H.

N84-18677*# National Aeronautics and Space Administration, Washington, D. C.
THE NASTRAN THEORETICAL MANUAL
Jan. 1981 944 p
(NASA-SP-221(06); NAS 1.21:221(06)) Avail: NTIS HC A99/MF A01 CSCL 20K

Designed to accomodate additions and modifications, this commentary on NASTRAN describes the problem solving capabilities of the program in a narrative fashion and presents developments of the analytical and numerical procedures that underlie the program. Seventeen major sections and numerous subsections cover; the organizational aspects of the program, utility matrix routines, static structural analysis, heat transfer, dynamic structural analysis, computer graphics, special structural modeling techniques, error analysis, interaction between structures and fluids, and aeroelastic analysis. A.R.H.

N84-18678*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONCEPTS FOR IMPROVING THE DAMAGE TOLERANCE OF COMPOSITE COMPRESSION PANELS
Marvin D. Rhodes and Jerry G. Williams Feb. 1984 42 p refs Presented at the 5th Conf. on Fibrous Composites in Structural Design, New Orleans, Jan. 1981
(NASA-TM-85748; NAS 1.15:85748) Avail: NTIS HC A03/MF A01 CSCL 20K

The residual strength of specimens with damage and the sensitivity to damage while subjected to an applied inplane compression load were determined for flatplate specimens and blade-stiffened panels. The results suggest that matrix materials that fail by delamination have the lowest damage tolerance capability. Alternate matrix materials or laminates which are transversely reinforced suppress the delamination mode of failure and change the failure mode to transverse shear crippling which occurs at a higher strain value. Several damage-tolerant blade-stiffened panel design concepts are evaluated. Structural efficiency studies conducted show only small mass penalties may result from incorporating these damage-tolerant features in panel design. The implication of test results on the design of aircraft structures was examined with respect to FAR requirements. A.R.H.

N84-18679*# Lockheed-Georgia Co., Marietta.
POSTOP: POSTBUCKLED OPEN-STIFFENER OPTIMUM PANELS-THEORY AND CAPABILITY
J. N. Dickson and S. B. Biggers Jan. 1984 51 p refs
(Contract NAS1-15949)
(NASA-CR-172259; NAS 1.26:172259) Avail: NTIS HC A04/MF A01 CSCL 20K

The computer program POSTOP was developed to serve as an aid in the analysis and sizing of stiffened composite panels that are loaded in the postbuckling regime. A comprehensive set of analysis routines was coupled to a widely used optimization program to produce this sizing code. POSTOP is intended for the preliminary design of metal or composite panels with open-section stiffeners, subjected to multiple combined biaxial compression (or tension), shear and normal pressure load cases. Longitudinal compression, however, is assumed to be the dominant loading. Temperature, initial bow eccentricity and load eccentricity effects are included. The panel geometry is assumed to be repetitive over several bays in the longitudinal (stiffener) direction as well as in the transverse direction. Analytical routines are included to compute panel stiffnesses, strains, local and panel buckling loads, and skin/stiffener interface stresses. The resulting program is applicable to stiffened panels as commonly used in fuselage, wing, or empennage structures. The analysis procedures and rationale for the assumptions used therein are described in detail. Author

N84-18680*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
COMPONENT MODE SYNTHESIS AND LARGE DEFLECTION VIBRATIONS OF COMPLEX STRUCTURES Final Report, 1 Nov. 1982 - 31 Oct. 1983
Chuh Mei Feb. 1984 16 p refs
(Grant NAG1-301)
(NASA-CR-173338; NAS 1.26:173338) Avail: NTIS HC A02/MF A01 CSCL 20K

The accuracy of the NASTRAN modal synthesis analysis was assessed by comparing it with full structure NASTRAN and nine other modal synthesis results using a nine-bay truss. A NASTRAN component mode transient response analysis was also performed on the free-free truss structure. A finite element method was developed for nonlinear vibration of beam structures subjected to harmonic excitation. Longitudinal deformation and inertia are both

included in the formula. Tables show the finite element free vibration results with and without considering the effects of longitudinal deformation and inertia as well as the frequency ratios for a simply supported and a clamped beam subjected to a uniform harmonic force. A.R.H.

N84-18681*# Lockheed-Georgia Co., Marietta.
SKIN-STIFFENER INTERFACE STRESSES IN COMPOSITE STIFFENED PANELS
J. T. S. Wang and S. B. Biggers Jan. 1984 29 p refs
(Contract NAS1-15949)
(NASA-CR-172261; NAS 1.26:172261) Avail: NTIS HC A03/MF A01 CSCL 20K

A model and solution method for determining the normal and shear stresses in the interface between the skin and the stiffener attached flange were developed. An efficient, analytical solution procedure was developed and incorporated in a sizing code for stiffened panels. The analysis procedure described provides a means to study the effects of material and geometric design parameters on the interface stresses. These stresses include the normal stress, and the shear stresses in both the longitudinal and the transverse directions. The tendency toward skin/stiffener separation may therefore be minimized by choosing appropriate values for the design variables. The most important design variables include the relative bending stiffnesses of the skin and stiffener attached flange, the bending stiffness of the stiffener web, and the flange width. The longitudinal compressive loads in the flange and skin have significant effects on the interface stresses. S.L.

N84-18682*# Lockheed-Georgia Co., Marietta.
POSTOP: POSTBUCKLED OPEN-STIFFENER OPTIMUM PANELS, USER'S MANUAL
S. B. Biggers and J. N. Dickson Jan. 1984 99 p refs
(Contract NAS1-15949)
(NASA-CR-172260; NAS 1.26:172260) Avail: NTIS HC A05/MF A01 CSCL 20K

The computer program POSTOP developed to serve as an aid in the analysis and sizing of stiffened composite panels that may be loaded in the postbuckling regime, is intended for the preliminary design of metal or composite panels with open-section stiffeners, subjected to multiple combined biaxial compression (or tension), shear and normal pressure load cases. Longitudinal compression, however, is assumed to be the dominant loading. Temperature, initial bow eccentricity and load eccentricity effects are included. The panel geometry is assumed to be repetitive over several bays in the longitudinal (stiffener) direction as well as in the transverse direction. Analytical routines are included to compute panel stiffnesses, strains, local and panel buckling loads, and skin/stiffener interface stresses. The resulting program is applicable to stiffened panels as commonly used in fuselage, wing, or empennage structures. The capabilities and limitations of the code are described. Instructions required to use the program and several example problems are included. A.R.H.

N84-18683*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENGINE CYCLIC DURABILITY BY ANALYSIS AND MATERIAL TESTING
Albert Kaufman and Gary R. Halford [1983] 19 p refs To be presented at the 61st Meeting of the Propulsion and Energetics Panel, Lisse, Netherlands, 30 May - 1 Jun. 1984; sponsored by AGARD
(NASA-TM-83577; E-1964; NAS 1.15:83577) Avail: NTIS HC A02/MF A01 CSCL 20K

The problem of calculating turbine engine component durability is addressed. Nonlinear, finite-element structural analyses, cyclic constitutive behavior models, and an advanced creep-fatigue life prediction method called strainrange partitioning were assessed for their applicability to the solution of durability problems in hot-section components of gas turbine engines. Three different component or subcomponent geometries are examined: a stress concentration in a turbine disk; a louver lip of a half-scale combustor liner; and a squealer tip of a first-stage high-pressure turbine blade. Cyclic structural analyses were performed for all three problems. The computed strain-temperature histories at the critical locations of the combustor linear and turbine blade components were imposed on smooth specimens in uniaxial, strain-controlled, thermomechanical fatigue tests of evaluate the structural and life analysis methods. Author

N84-18684# National Aerospace Lab., Tokyo (Japan).
BUCKLING STRENGTH OF CORRUGATED SHEAR WEBS
Shiago Sanbongi and Susumu Toda 1983 17 p refs In JAPANESE; ENGLISH summary
(NAL-TR-759; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The buckling strength of corrugated shear webs was investigated. A finite element program containing a curved strip element was used in the analysis. Effects of geometrical parameters such as ratio of web depth to pitch and ratio of amplitude to pitch in corrugation were discussed. Buckling stresses obtained from an approximate solution to the corrugated plates by using an anisotropic plate model were compared with those obtained from finite element solutions. Experimental results were obtained from tests performed on polyester corrugated plates and were compared with computed results. Author

N84-18685*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
EFFECT OF CREEP IN TITANIUM ALLOY Ti-6Al-4V AT ELEVATED TEMPERATURE ON AIRCRAFT DESIGN AND FLIGHT TEST
Jerald M. Jenkins Feb. 1984 11 p refs Prepared in cooperation with NASA, Ames Research Center
(NASA-TM-86033; H-1228; NAS 1.15:86033) Avail: NTIS HC A02/MF A01 CSCL 20K

Short-term compressive creep tests were conducted on three titanium alloy Ti-6Al-4V coupons at three different stress levels at a temperature of 714 K (825 F). The test data were compared to several creep laws developed from tensile creep tests of available literature. The short-term creep test data did not correlate well with any of the creep laws obtained from available literature. The creep laws themselves did not correlate well with each other. Short-term creep does not appear to be very predictable for titanium alloy Ti-6Al-4V. Aircraft events that result in extreme, but short-term temperature and stress excursions for this alloy should be approached cautiously. Extrapolations of test data and creep laws suggest a convergence toward predictability in the longer-term situation. Author

N84-18686# Army Engineer Waterways Experiment Station, Livermore, Calif. Structures Lab.
COMPUTER-AIDED ANALYSIS OF CONCRETE STRENGTH TEST RESULTS Final Report
R. L. Campbell, Sr. Oct. 1983 89 p
(AD-A136265; WES/INSTRUCTION/SL-83-1) Avail: NTIS HC A05/MF A01 CSCL 11/2

This report documents a computer-aided statistical analysis program that is primarily designed to: (1) process laboratory strength test results and generate regression data for accelerated versus design-age strengths, and (2) process field strength test results using laboratory regression data and generate predicted design-age and required average strengths in accordance with EM 1110-2-2000, Standard Practice for Concrete. The statistical portions of the program were written to comply with Recommended Practice for Evaluation of Strength Test Results of Concrete, ACI 214-77 and Use of Accelerated Strength Testing, ACI 214.1R-81. The program is an interactive time-sharing program written in Honeywell Level 66 FORTRAN language. The program is accessible through the CORPS Computer Library System as program X0064. A graphics terminal such as the Tektronic 4014 is required to take full advantage of the capabilities of the program. Output data are presented in tabular or graph form or both. Author (GRA)

N84-18687# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
LEAST FAVORABLE RESPONSE OF INELASTIC STRUCTURES

Interim Report
F. C. Chang, T. L. Paez, and Frederick D. Ju Mar. 1983 58 p
(Grant AF-AFOSR-0086-81; AF Proj. 2307)
(AD-A136289; CE-63(83)AFOSR-993-1; AFOSR-83-1226TR) Avail: NTIS HC A04/MF A01 CSCL 20/11

In the design of a structural system, a test input is sought to conservatively represent an ensemble of measured field inputs. When a structure survives the test input, it is assumed that it would survive the field inputs. The method of shock response spectra is a technique for specifying conservative test inputs, but it has some disadvantages. In this investigation a technique is developed for the specification of test inputs. It is based on the method of least favorable response, and it overcomes some of the shortcomings of the method of shock response spectra. Numerical examples show that the present technique can be used in practical applications. Author (GRA)

N84-18688# New Mexico Univ., Albuquerque. Dept. of Civil Engineering.
IDENTIFICATION OF DAMAGE IN HYSTERETIC STRUCTURES Annual Report, 1 Feb. 1982 - 28 Feb. 1983
Ming-Liang Wang, Thomas L. Paez, and Frederick D. Ju Jul. 1983 209 p
(Grant AF-AFOSR-0086-81; AF Proj. 2307)
(AD-A136342; AFOSR-83-1230TR) Avail: NTIS HC A10/MF A01 CSCL 13/13

In structural engineering it is imperative to design each system to survive the inputs anticipated over the design life of the structure. Strong motion inputs cause systems to execute nonlinear responses, and during the strong motion responses, structures accumulate damage. Therefore, the capability to model nonlinear responses and to assess the damage level in a structure is essential for optimal design. Techniques for the diagnosis of damage in inelastic structures have been developed. The dissipated energy in mechanical systems is taken as a measure of damage accumulation. Two models for the simulation of damaged structural response have been developed. Both the single-degree-of-freedom and multi-degree-of-freedom systems were included in the analysis. The objective of this study is to use these models to estimate the amount of energy dissipated due to a strong motion input. The results show that structural damage can be predicted, even in the presence of measurement noise. Author (GRA)

N84-18689# Wisconsin Univ., Madison. Mathematics Research Center.
COMBINED TENSION-TORSION OF A CYLINDRICAL MIXTURE OF AN ELASTIC SOLID AND FLUID
Mukesh Gandhi (Michigan Univ., Ann Arbor), K. R. Rajagopal (Pittsburgh Univ.), and A. S. Wineman (Michigan Univ., Ann Arbor) Oct. 1983 21 p
(Contract DAAG29-80-C-0041)
(AD-A136351; MRC-TSR-2587) Avail: NTIS HC A02/MF A01 CSCL 20/11

In his study of combined finite extension and torsion of a nonlinearly elastic cylinder, Rivlin established a relation for the torsional stiffness which depends only on the axial force, the axial extension ratio and the radius of the undeformed cylinder, in the case of small twist. The relationship did not depend on the structure of the stored energy function and is hence termed a Universal Relation. In this paper the authors extend Rivlin's result to the case of combined extension and torsion of a cylindrical mixture of a nonlinearly elastic solid and fluid. Author (GRA)

N84-18690# California Univ., Berkeley. Center for Pure and Applied Mathematics.
DYNAMIC ANALYSIS OF STRUCTURES USING LANCZOS COORDINATES
B. Nour-Omid and R. W. Clough Nov. 1983 24 p
(Contract N00014-76-C-0013)
(AD-A136387; PAM-186) Avail: NTIS HC A02/MF A01 CSCL 12/1

A procedure for deriving the Lanczos Coordinates is explained and their use in structural dynamics analysis as an alternative to modal coordinates is discussed. The coordinates are obtained by an inverse iteration procedure in which orthogonality is imposed between the vectors resulting from successive iteration cycles. Using these Lanczos coordinates the equations of motion are transformed to tridiagonal form, which provides for very efficient time-stepping solution. The effectiveness of the method is demonstrated by a numerical example. Author (GRA)

N84-18691# General Dynamics Corp., Fort Worth, Tex.
DEVELOPMENT OF FATIGUE AND CRACK PROPAGATION DESIGN AND ANALYSIS METHODOLOGY IN A CORROSIVE ENVIRONMENT FOR TYPICAL MECHANICALLY-FASTENED JOINTS. VOLUME 1: PHASE I DOCUMENTATION Final Report, May 1981 - Sep. 1982
Y. H. Kim, R. P. Wei (Lehigh Univ.), D. E. Gordon, S. M. Speaker, and S. D. Manning Warminster, Pa. NADC Mar. 1983 237 p
(Contract N62269-81-C-0268; F41-400)
(AD-A136414; NADC-83126-60-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 20/11

A corrosion fatigue methodology has been developed for predicting the crack initiation and crack propagation behavior of mechanically-fastened joints. An experimental test program was also conducted using 7075-T7651 aluminum alloy and beta-annealed Ti-6Al-4V alloy to evaluate the effects of environment, test frequency, R-ratio, holding-time, and stress level on corrosion fatigue behavior. Based on this investigation, it was concluded that: the reaction between aqueous environments and the 7075-T7651 aluminum alloy appears to be limited. Hence, a special crack propagation model for corrosion fatigue is not required for design; a better understanding of the corrosion fatigue behavior of beta-annealed Ti-6Al-4V alloy is needed before a reliable predictive methodology can be developed for mechanically-fastened joints; and the corrosion fatigue predictive methodology developed looks promising for constant amplitude applications. Now, the predictive methodology needs to be further developed to account for spectrum loading and variance in the input data base. GRA

N84-18692# General Dynamics Corp., Fort Worth, Tex.
DEVELOPMENT OF FATIGUE AND CRACK PROPAGATION DESIGN AND ANALYSIS METHODOLOGY IN A CORROSIVE ENVIRONMENT FOR TYPICAL MECHANICALLY-FASTENED JOINTS. VOLUME 2: STATE-OF-THE-ART ASSESSMENT Final Report, May 1981 - Sep. 1982
Y. H. Kim, S. M. Speaker, R. P. Wei (Lehigh Univ.), and S. D. Manning Warminster, Pa. NADC Mar. 1983 86 p
(Contract N62269-81-C-0268; F41-400)
(AD-A136415; NADC-83126-60-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 20/11

Navy corrosion fatigue design requirements for metallic airframes and general design practices for satisfying these requirements are briefly reviewed. The phenomenon of and mechanisms responsible for corrosion fatigue crack initiation are reviewed. The mechanisms discussed include the stress-concentration pit mechanism, the film rupture mechanism, and the preferential dissolution mechanism. Two fracture mechanics models are described and discussed for quantitatively predicting the number of cycles to corrosion fatigue crack initiation: stress-initiation life model and strain-initiation life model. Methods are also discussed for using these initiation models for spectrum loading applications. Corrosion fatigue crack propagation mechanisms are reviewed and existing models are critiqued. Propagation models evaluated include a surface reaction controlled model, a transport controlled model, and a diffusion controlled model. These models recognize hydrogen embrittlement as the overwhelming cause of corrosion fatigue propagation enhancement. Models for load-environment interaction are described and discussed, including the generalized Wheeler model, the generalized Willenborg model, the generalized Closure model and the Vroman/Chang model. GRA

N84-18693# Connecticut Univ., Storrs.
NEW METHOD OF ANALYZING VIBRATION OF CRACKED

CYLINDRICAL SHELLS Final Report, 1 Aug. 1980 - 30 Sep. 1982
Roman Solecki 26 Dec. 1983 72 p
(Contract N00014-81-K-0651; NR Proj. 064-670)
(AD-A136637; UCONN-ME-82-83-ONR-1) Avail: NTIS HC A04/MF A01 CSCL 13/13

The method of Fourier transformation of functions with lines of discontinuity and with built-in point singularities, is applied to analysis of vibration of cracked rectangular plates and of cracked cylindrical shells of rectangular planform. Application of the above method in conjunction with Green-Gauss theorem leads to an infinite system of linear algebraic equations. Its characteristic determinant when equated to zero provides with the frequency equation. Numerical examples include a plate with a parallel crack, a plate with a diagonal crack and a shell cracked at the apex.
Author (GRA)

N84-18694# Illinois Univ., Urbana. Dept. of Civil Engineering.
DEVELOPMENT OF A STRESS-DEPENDENT FINITE ELEMENT SLAB MODEL Annual Report, 6 Jan. 1982 - 30 Apr. 1983
M. R. Thompson, E. J. Barenberg, A. M. Ioannides, and J. A. Fischer May 1983 182 p
(Grant AF-AFOSR-0143-82; AF Proj. 2307)
(AD-A135836; AFOSR-83-1061TR) Avail: NTIS HC A09/MF A01 CSCL 13/2

The concept of the Resilient Modulus of Subgrade Reaction, K sub R, developed to account for the stress dependent behavior of typical fine-grained subgrade soils. This new subgrade support parameter is defined as plate pressure/resilient deflection in an impulse plate load test simulated using finite element program ILLI-PAVE. The resilient modulus of subgrade reaction, K sub R, is expressed in the same units as the standard static modulus of subgrade reaction, K, but the value of the former is significantly higher. This indicates increased stiffness in response to rapidly moving loads. The finite element model presented in this report is a modified and expanded version of ILLI-SLAB, developed in 1977 for the study of jointed, slab-on-grade pavements. A number of modifications to the original code are described. The most important of these is the incorporation, through an iterative procedure, of the deflection dependent Resilient Modulus of Subgrade Reaction (K sub R). This parameter is considered more appropriate in modeling nonlinear subgrade response to rapidly moving loads. Other changes include: generation of contour plots of system response; introduction of specification of loaded areas in terms of global coordinates; and, free-form input capability. To illustrate the impact of these innovations, results from several demonstration runs are summarized. The major effect of the proposed model is due to the higher values of K sub R, compared to the commonly used static K. GRA

N84-18695# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
EXACT AND FINITE-ELEMENT ANALYSIS OF LAMINATED SHELLS Interim Report
J. N. Reddy Nov. 1983 73 p
(Grant AF-AFOSR-0142-81; AF Proj. 2307)
(AD-A135849; VPI-E-83-45; AFOSR-81-5TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The two parts of the report deal with the exact solutions of the linear theory and finite-element analysis of the geometrically nonlinear (i.e. the von Karman) theory of laminated, doubly-curved, shells, respectively. Numerical results are presented for both plates and shells. The results should serve as references for future investigations. Author (GRA)

N84-18696# Cincinnati Univ., Ohio. Dept. of Civil and Envionmental Engineering.
REINFORCED CONCRETE RESPONSE TO NEAR FIELD EXPLOSIONS Final Report, 1 Jul. 1981 - 30 Jun. 1982
T. Michael Baseheart 20 Jun. 1983 49 p
(Grant AF-AFOSR-0167-81; AF Proj. 2307)
(AD-A135876; AFOSR-83-1064TR) Avail: NTIS HC A03/MF A01 CSCL 19/4

From a review of experimental test results for concrete slabs subjected to conventional blast loading, various failure mechanisms and their relationship to scaled breach distance are documented. Analytical studies demonstrate the failure of membrane action when included with the rigid flexural analysis of structural response. For more intense blast pressure intensities, procedures available in the literature are described. Author (GRA)

N84-18697# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE USEFULNESS OF IMPACT DAMPERS FOR SPACE APPLICATIONS M.S. Thesis
B. W. Gibson Mar. 1983 147 p
(AD-A135695; AFIT/GA/AA/83M-2) Avail: NTIS HC A07/MF A01 CSCL 20/11

The usefulness of the impact damper in eliminating vibrations is studied analytically and experimentally. Laboratory models of vibrating systems are constructed to evaluate the performance of the impact damper in reducing or eliminating forced and free vibrations. A computer simulation of a single degree-of-freedom primary system in free vibration employing an impact damper is constructed for the same purpose. Laboratory free vibration results are compared to the computer simulation in order to judge its accuracy. The computer simulation is employed to determine the impact damper's performance in free vibration as the system's parameters are varied. Two significant measures of the damper's effectiveness are obtained as approximate functions of the system's parameters. Observations regarding reduction in amplitude and steady state motion were made for the impact damper in forced vibration. Author (GRA)

N84-18698# California Univ., Berkeley. Dept. of Mechanical Engineering.
CALCULATIONS FOR UNIAXIAL STRESS AND STRAIN CYCLING IN PLASTICITY
P. M. Naghdi and D. J. Nikkel, Jr. Nov. 1983 27 p
(Contract N00014-75-C-0148; NR Proj. 064-436)
(AD-A135800; UCB/AM-83/8) Avail: NTIS HC A03/MF A01 CSCL 12/1

Within the framework of an existing purely mechanical, rate-type theory of plasticity detailed calculations are presented for certain types of material response during stress and strain cycling in a uniaxial homogeneous deformation. These features pertain specifically to material response in stress cycling between fixed values of stress in tension and compression (not necessarily equal in magnitude) resulting in ratcheting of strain, and a type of saturation hardening caused by strain cycling between any two fixed values of strain when the mean value of stress (in tension and compression) tends to zero. Author (GRA)

N84-18699# Army Chemical Systems Lab., Aberdeen Proving Ground, Md. Product Assurance Directorate.
DESIGN CONSIDERATIONS OF PLATENS FOR VIBRATION TESTING Final Report
Louie Jackson Lipp Nov. 1983 43 p
(DA Proj. 1M4-63721-DJ-30)
(AD-A135815; AD-E401110; ARPAD-TR-83003) Avail: NTIS HC A03/MF A01 CSCL 14/2

Vibration testing, particularly when performed in reliability test chambers, is very costly. Discussed in this report are design considerations for a vibration test platen which will accept several test specimens for simultaneous testing. Well designed platens will provide more meaningful results and reduce test time and costs through maximum utilization of test hardware. Specific points covered are: Bending modes at the platen's frequency; Determining the resonant frequency of a test platen; Determining the damping energy of a platen design; Obtaining signal feedback for vibration control purposes; Deriving equations for resonant frequencies and damping energies. GRA

N84-18700# Cairo Univ. (Egypt). Dept. of Mechanical Design and Production.
INELASTIC DEFORMATION OF METALS AND STRUCTURES

UNDER DYNAMIC AND QUASI-STATIC CYCLIC LOADING Annual Technical Report, 23 May 1982 - 28 May 1983
A. M. Eleiche and M. M. Megahed May 1983 82 p
(Contract DAJA37-81-C-0236; DA Proj. 1T1-61102-BH-57)
(AD-A136022) Avail: NTIS HC A05/MF A01 CSCL 20/11

The investigations of the modes of cyclic plastic behavior in tubes under internal pressure and cyclic thermal gradient have been continued. An approximate uniaxial model of the biaxial tube problem is used for studying the influence of the hardening rule on the cyclic plastic behavior. Comparisons are made between kinematic and isotropic hardening rules. These two theories represent the extremes of cyclic plastic behavior. The cyclic plastic behavior of specimens used in the so-called pulley test are studied using linear kinematic hardening theory. The pulley test simulates the cyclic thermal stresses by means of cyclic bending of a thin specimen around the circumference of a freely rotating pulley. Theoretical results for stress and strain behavior are obtained for both wire and strip specimens. In Part 3, the reference stress method - which has been used with great success in the analysis of creeping structures - is applied to the analysis of components operating under conditions where cyclic hardening and cyclic creep are dominant. GRA

N84-18701# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
EFFICIENT FINITE ELEMENT METHODS FOR TRANSIENT NONLINEAR ANALYSIS OF SHELLS Annual Report, 1 Feb. 1982 - 31 Jan. 1983
Ted Belytschko Aug. 1983 175 p
(Contract F49620-82-K-0013; AF Proj. 2307)
(AD-A136044; AFOSR-83-1062TR) Avail: NTIS HC A08/MF A01 CSCL 13/13

A finite element formulation and algorithm for the nonlinear analysis of the large deflection, materially nonlinear response of impulsively loaded shells is presented. A unique feature of this algorithm is the use of a bilinear four node quadrilateral element with single point quadrature and a simple hourglass control which is orthogonal to rigid body modes on an element level and does not compromise the consistency of the equations. The geometric nonlinearities are treated by using a corotational description wherein a coordinate system that rotates with the material is embedded at the integration point; thus the algorithm is directly applicable to anisotropic materials without any corrections for frame invariance of material property tensors. This algorithm can treat about 200 element-time-steps per CPU second on a CYBER 170/730 computer in the explicit time integration mode. Numerous results are presented for both elastic and elastic-plastic problems with large strains that show that the method in most cases is comparable in accuracy with an earlier version of this algorithm employing a cubic triangular plate-shell element, but substantially faster.
Author (GRA)

N84-18702# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
FRACTURE BEHAVIOR UNDER IMPACT Annual Report, Feb. 1982 - Jan. 1983
J. F. Kalthoff and S. Winkler Jan. 1983 49 p
(Contract DAJA37-81-C-0013; DA Proj. 1T1-61102-BH-57)
(AD-A136056; W-10/83; AR-2) Avail: NTIS HC A03/MF A01 CSCL 20/11

The physical behavior of cracks under impact loading is investigated. Single edge cracks or arrays of multiple cracks in rectangular specimens are considered. The specimens are loaded by time dependent tensile stress pulses moving perpendicular to the crack direction. The specimens are directly loaded by an impinging projectile or by a base plate which is accelerated by a projectile. The specimens are made from a transparent model material or a high strength steel. The initial crack lengths and impact velocities are varied throughout the experiments. Utilizing the shadow optical method of caustics in combination with high speed photography, the dynamic stress intensity factor at onset of rapid crack propagation, i.e. the dynamic fracture toughness Kld, is determined and discussed with regard to the time tf at which the crack becomes unstable. The results are compared to corresponding static fracture toughness data. Within the second year of the three years research project many experiments of the proposed main investigations have been carried out: First the dependence of the impact fracture toughness Kld on loading rate has been investigated. Specimens from the Araldite B with single edge cracks have been tested under base plate - and under direct impact loading conditions. Within the range of loading rates achieved so far, the measured impact fracture toughness Kld do not show a dependence from loading rate. GRA

N84-18703# Fraunhofer Inst. fuer Werkstoffmechanik, Freiburg (West Germany).
FRACTURE BEHAVIOR UNDER IMPACT Semiannual Progress Report, Feb. - Jul. 1983
J. F. Kalthoff and S. Winkler Jul. 1983 83 p
(Contract DAJA37-81-C-0013; DA Proj. 1T1-61102-BH-57)
(AD-A136057; W-11/83; SAPR-3) Avail: NTIS HC A05/MF A01 CSCL 20/11

The physical behavior of cracks under impact loading is investigated. Single edge cracks or arrays of multiple cracks in rectangular specimens are considered. The specimens are loaded by time dependent tensile stress pulses moving perpendicular to the crack direction. The specimens are either directly loaded by an impinging projectile or by a base plate which is accelerated by the projectile. The specimens are made from a transparent model material or a high strength steel. The initial crack lengths and impact velocities are varied throughout the experiments. Utilizing the shadow optical method of caustics in combination with high speed photography, the dynamic stress intensity factors at the tip of the crack are measured as functions of time during the impact event. The critical value of the dynamic stress intensity factor at onset of rapid crack propagation, i.e. the dynamic fracture toughness Kld, is determined and discussed with regard to the times tf at which the crack becomes unstable. The results are compared with corresponding static fracture toughness data. GRA

N84-18704# California Univ., Berkeley. Dept. of Mechanical Engineering.
SOME REMARKS ON RATE-DEPENDENT PLASTICITY
P. M. Naghdi Sep. 1983 35 p
(Contract N00014-75-C-0148)
(AD-A136084; UCB/AM-83/6) Avail: NTIS HC A03/MF A01 CSCL 20/11

First, some motivation is provided for the development of a relatively simple rate-dependent theory of plasticity based on an elastic-viscoplastic constitutive model. This idealization includes unloading and allows for suitable definition of plastic strain. Next, within the scope of a purely mechanical theory, a special constitutive response is used to discuss the nature of constitutive restrictions for a finitely deforming rate-dependent material, which are obtained from an appropriate work inequality. With the help of these restrictions, certain features of the theory are elaborated upon with particular reference to normality and convexity.
Author (GRA)

N84-18705# Tufts Univ., Medford, Mass. Dept. of Chemical Engineering.
DURABILITY AND FAILURE ANALYSES OF A SILANE TREATED ALPHA-AL2O3/POLYETHYLENE JOINT IN WET ENVIRONMENT Final Report
A. Kaul, N. H. Sung, I. Chin (MIT), and C. S. P. Sung (MIT) Jun. 1983 31 p
(Contract F49620-79-C-0085; AF Proj. 2303)
(AD-A136089; AFOSR-83-1173TR; ARO-16355.5-MS) Avail: NTIS HC A03/MF A01 CSCL 11/1

Investigated is the durability of the joints (Alpha-Al2O3/Gamma-APS/PE) in wet environment as a function of the gamma-APS thickness, dehydration of gamma-APS prior to joint formation and redrying the joint after a certain exposure. The joint strength measured by peel strength is found to decrease with exposure time in wet environment more rapidly in water than in 100% RH. With exposure time, the debonded area increases from the edges

toward the central area of the joint. Relatively thin gamma-APS treatment on alpha-Al2O3 appear to provide more durable joint than thicker gamma-APS treatment resulting in an optimal thickness in the range of 0.3 approx.1% gamma-APS concentration level. Dehydration of gamma-APS lead to more durable joint with an optimal condition found between 1 approx. 2 days of dehydration at 100 deg C in vacuum. Regardless of the gamma-APS thickness and dehydration history, the failure in debonded area seems to occur by the hydrolysis of gamma-APS near alpha-Al2O3 side and by the deformation of polyethylene (cohesive failure) in the peeled area, as characterized by SEM and ESCA. The debonded area in the dried joint recovers little strength but in the bonded central areas, the strength is largely recovered, characterized by the extensive deformation of polyethylene. Diffusion of water in gamma-APS near alpha-Al2O3 side rather than PE side can explain at least qualitatively most of the observed trends. Comparisons are made for the effects of gamma-APS thickness and dehydration on the durability in wet environment and adhesion promotion in dry environment as well as on their respective failure mode. GRA

N84-18706# Forest Products Lab., Madison, Wis.
LONG-TERM LOAD PERFORMANCE OF HARDBOARD I-BEAMS
J. D. McNatt and M. J. Superfesky Nov. 1983 12 p
(AD-A136091; FSRP-FPL-441) Avail: NTIS HC A02/MF A01 CSCL 11/12

Built-up I-beams with hardboard shear webs and laminated-veneer lumber flanges exhibited satisfactory performance when subjected to constant loads for up to 5 years in interior, protected exterior, and controlled cyclic humidity environments. Creep deflection was greatest for beams in the cyclic humidity environment and least for those in the interior environment. For beams loaded at the same stress level in a given environment, deflection was greater for beams made with web material having the lower shear stiffness. Except for 6-foot beams in the cyclic humidity environment, static tests on beams after long-term loading did not reveal any loss in strength or stiffness. Author (GRA)

N84-18707# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapon Systems Lab.
BEHAVIOR OF PRESSURIZED CYLINDERS WITH MULTIPLE INTERNAL CRACKS Final Report
J. F. Throop and F. Fujczak Sep. 1983 42 p
(AD-A136104; ARLCB-TR-83030) Avail: NTIS HC A03/MF A01 CSCL 19/6

Thick-walled cylinders containing more than one internal crack are compared with one containing a single crack. Their crack growth and strain behavior show that one of the cracks becomes dominant and controls the failure. Monitoring the circumferential strain over the dominant crack gives an indication of when failure is imminent. GRA

N84-18708# Colorado Univ., Boulder. Dept. of Civil Environmental and Architectural Engineering.
THE STRENGTH AND BEHAVIOR OF STEEL FIBER-REINFORCED CONCRETE UNDER COMBINED TENSION-COMPRESSION LOADING Interim Report
R. W. Meier, H. Y. Ko, S. Sture, and C. C. Feng May 1983 358 p
(Grant AF-AFOSR-0072-81; AF Proj. 2307)
(AD-A136124; AFOSR-83-0974TR) Avail: NTIS HC A16/MF A01 CSCL 13/3

The addition of steel fibers to concrete-type materials has been shown to improve many of the engineering properties of those materials. Notable among them is an enhancement in the tensile strength of an otherwise weak and brittle material. Although much is known about the tensile strength of steel-fiber reinforced concrete (SFRC) under one dimensional state of stress, little is known with regard to the strength behavior under multi-dimensional tension-compression loading. This is attributed to a lack of suitable equipment for simultaneously applying tensile and compressive stresses. The research program described herein is focused on developing such equipment to study the behavior of SFRC under combined loadings. A review of the state-of-the-art research on the tensile strength of SFRC is given and a review of various methods of applying tensile stresses to concrete specimens is presented. The problem is to be overcome in applying a pure principal tensile stress are discussed. GRA

N84-18709# Stuttgart Univ. (West Germany). Lehrstuhl fuer Materialpruefung, Werkstoffkunde und Festigkeitslehre.
EXTENDED EXPERIMENTAL AND THEORETICAL INVESTIGATIONS TO QUANTIFY DUCTILE FRACTURE BEHAVIOR, USING MnMoNI 55 [ERWEITE EXPERIMENTELLE UND THEORETISCHE UNTERSUCHUNGEN ZUR QUANTIFIZIERUNG DES ZAEHBRUCHVERHALTENS AM BEISPIEL DES WERKSTOFFS 20 MNMONI 55]
Ebernard Roos Jul. 1982 237 p refs In GERMAN
(MPA-82-01; ISSN-0721-4529) Avail: NTIS HC A11/MF A01

Ductile fracture tests were performed on 20 MnMoNi55 and the results were compared with theoretical approaches. Compact tension (CT) probes and plane tension probes notched at both sides were tested. Crack resistance curves are determined, together wit crack initiation values, load contact line displacement, J integral as a function of load, and J integral initiation valve. The experimental results agree the theoretical approximations. Small probes show a higher fracture strength than large specimens. Test results concerning crack propagation up to instability show an unsatisfactory agreement with approximations from the literature. Author (ESA)

N84-18710*# Stuttgart Univ. (West Germany). Staatliche Materialpruefungsanstalt.
INFLUENCE OF DEFORMATION BEHAVIOR, OXYDATION, AND TEMPERATURE ON THE LONG TIME CYCLIC STRESS BEHAVIOR OF HIGH TEMPERATURE STEELS [EINFLUSS DES VERFORMUNGSVERHALTENS, DER OXYDATION UND DER TEMPERATUR AUF DAS LANGZEITDEHNUNGSWECHSELVERHALTEN DER WARMFESTEN STAEHLE]
Karl Maile Jul. 1982 273 p refs In GERMAN
(MPA-82-02; ISSN-0721-4529) Avail: NTIS HC A12/MF A01

The influence of different parameters on the creep-fatigue behavior of several steel alloys was investigated. The higher the temperature the lower the crack initiation value. Pauses during the cycle reduce the damage. Oxidation reduces and protective gas increases the lifetime. Prior loading and prior deformation reduce the lifetime. Short annealing slightly affects the cycle stress behavior. The test results do not satisfactorily agree with methods of extrapolation and damage accumulation. Author (ESA)

N84-18711# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abt. Elastomechanik und Aeroelastische Stabilitaet.
THE EXPERIMENTAL/ANALYTICAL DETERMINATION OF THE REAL NORMAL MODE PARAMETERS OF A STRUCTURE WITH LIMITED ACCESSIBILITY Ph.D. Thesis - Hannover Univ.
Norbert Niedbal Apr. 1983 129 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-839)
(DFVLR-FB-83-26; ESA-TT-839) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 42

Phase separation methods for the experimental determination of normal mode parameters are proposed. As opposed to the classical phase resonance method, these methods require no adjustment of the exciter forces. In the case of a structure with limited accessibility, such methods improve the experimental modal analysis. A phase separation method is selected and its reliability enhanced for the case of damping coupling. A method to transform complex normal mode parameters into real normal ones is presented. Author (ESA)

N84-18712# Engineering System International, Rungis (France).
MODAL DEFORMATIONS AND STRESSES Final Report
P. Lacoste Paris ESA Jan. 1983 94 p refs
(Contract ESTEC-4708/81/NL-AK)
(ED-81-343/RD; ESA-CR(P)-1777) Avail: NTIS HC A05/MF A01

The fixed, free and loaded modal synthesis interface methods, and the general Lagrangian reduction methods were reviewed, using a uniform beam example. The free interface method always provides the least accurate results. The loaded interface method is best for the first elastic modes. Fixed interface method accuracy is comparable to the loaded interface method. The fixed interface method permits a completely separate analysis of each substructure and may be more appropriate for industrial applications. In order to improve the basic methods, residuals of up to the ninth order were derived for each of the interface cases. The improvements brought by higher order approximations can be shown on low and high frequencies. The improvements can be drastic when few modes are kept for each substructure. Here the basic fixed interface method of order 1 yields unacceptable results, while the second and third order methods yield a few good frequencies. Methods with zero order approximations are generally unacceptable. Author (ESA)

N84-18713# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
NEW ANALYTICAL METHODS FOR THE PREDICTION OF FATIGUE CRACK GROWTH UNDER REALISTIC LOADING
H. H. vanderLinden, A. U. deKoning, and C. J. Lof 22 Nov. 1982 25 p refs Submitted for publication
(Contracts NIVR-1777; NIVR-1822; NIVR-1823; NIVR-1776)
(NLR-MP-82055-U) Avail: NTIS HC A02/MF A01

Analytical techniques for crack growth rate prediction are described. A model for prediction of fatigue crack growth in aluminum alloy sheet specimens subjected to service loading conditions, and the application of linear elastic fracture mechanics to three dimensional crack growth predictions under constant amplitude loading are outlined. For centrally cracked sheet specimens subjected to flight simulation loading, crack growth rate and fatigue life predictions agree very well with experimental results. The calculation of the growth of corner cracks is applicable to relatively simple fatigue loading types, such as constant amplitude loading. Crack propagation life predictions for corner and surface cracks under constant amplitude loading can be made with an accuracy of 10 % to 15 %. Use of the derivative of the stress intensity factors for obtaining the crack shape parameter is promising. Author (ESA)

N84-18714# Earthquake Engineering Research Inst., Berkeley, Calif.
OPTIMAL DESIGN OF FRICTION-BRACED FRAMES UNDER SEISMIC LOADING
M. A. Austin and K. S. Pister Jun. 1983 106 p refs
(Grant NSF PFR-79-08261)
(PB84-119288; UCB/EERC-83/10; NSF/CEE-83015) Avail: NTIS HC A06/MF A01 CSCL 13M

The results of a multi-objective investigation are described. Several optimal earthquake-resistant designs for a ten story, single bay, friction-braced steel braced steel frame excited by a single scaled ground motion are calculated. As this was only the second major problem area to be examined with the CAD environment DELIGHT STRUCT, a further assessment of its performance was also required. The frame's performance is assessed on the basis of its response to three different loading; gravity loads only, gravity loads plus moderate earthquake and finally gravit loads combined with a rare severe earthquake ground motion. GRA

N84-18715# Tracor Hydronautics, Inc., Laurel, Md.
FATIGUE TESTING OF OTEC COLD WATER PIPE GLASS-REINFORCED PLASTIC MATERIALS
Charles R. Sirian and Andrew F. Conn Sep. 1983 83 p
(Grant NA80SA-M-00653)
(PB84-128958; TR-80032-10-1; NOAA-83120903) Avail: NTIS HC A05/MF A01 CSCL 10B

Specimens of a GFRP (glass fiber reinforced plastic) composite laminate - a candidate material for use in an OTEC cold water pipe (CWP) - were subjected to cyclic bending while immersed in a synthetic sea water solution. The loss of stiffness, i.e., decrease in bending modulus, for this GFRP was determined as a function of cycles of loading. GRA

N84-18471# European Space Research and Technology Center, Noordwijk (Netherlands).
A RATIONALE FOR THE TESTING OF SPACE MECHANISMS
H. M. Briscoe *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 149-156 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

42 GEOSCIENCES (GENERAL)

N84-18716*# Science Applications, Inc., McLean, Va.
SPACEBORNE GRAVITY GRADIOMETERS
William C. Wells, ed. Mar. 1984 82 p refs Workshop held in Greenbelt, Md., 28 Feb. - 2 Mar. 1983
(Contract NASw-3622)
(NASA-CP-2305; NAS 1.55:2305) Avail: NTIS HC A05/MF A01 CSCL 14B

The current status of gravity gradiometers and technology that could be available in the 1990's for the GRAVSAT-B mission are assessed. Problems associated with sensors, testing, spacecraft, and data processing are explored as well as critical steps, schedule, and cost factors in the development plan. For individual titles, see N84-18717 through N84-18721.

N84-18717*# Science Applications, Inc., McLean, Va.
SPACEBORNE GRAVITY GRADIOMETERS. PART 1: SUMMARY AND RECOMMENDATIONS
In its Spaceborne Gravity Gradiometers Mar. 1984 p 1-11 (For primary document see N84-18716 09-42)
Avail: NTIS HC A05/MF A01 CSCL 08N

The purpose, objectives, and organization of the workshop are described. Highlights of each presentation are included. Recommendations to NASA for developing a flight qualified gravity gradiometer for use in the global mapping of the gravity fields of the Earth and eventually the planets are formulated. A.R.H.

N84-18718*# Science Applications, Inc., McLean, Va.
SPACEBORNE GRAVITY GRADIOMETERS. PART 2: ROLE OF GRAVITY GRADIOMETERS IN NASA'S PROGRAMS
In its Spaceborne Gravity Gradiometers Mar. 1984 p 13-22 (For primary document see N84-18716 09-42)
Avail: NTIS HC A05/MF A01 CSCL 08N

Sources of information for present knowledge of Earth's gravitational field are discussed as well as the Goddard Earth models. Improvements to these models can be achieved by using additional data and reprocessing some earlier data. Plans for using satellite-to-satellite tracking and gravity gradiometers for the geopotential research mission are considered as well as the relative merits of each method. Present knowledge of solar system bodies and strategies for their exploration are also described. A core program for planetary exploration through the year 2000 is summarized as well as ten candidate subsequent missions. Of these, the lunar geoscience orbiter has the best justification for a gravity gradiometer since far side gravity data can be acquired without the requirement for a separate communications relay satellite. For rendezvous missions, the gradiometer can permit on-board automation of orbit computation and control thus reducing the time devoted to communication with an orbiter. A.R.H.

N84-18719*# Science Applications, Inc., McLean, Va.
SPACEBORNE GRAVITY GRADIOMETERS. PART 3: INSTRUMENT STATUS AND PROSPECTS
In its Spaceborne Gravity Gradiometers Mar. 1984 p 23-50 (For primary document see N84-18716 09-42)
Avail: NTIS HC A05/MF A01 CSCL 14B

Various technologies incorporated in the development of gravity gradiometers are demonstrated through descriptions of specific

instruments. Concepts covered include: rotating, spherical, cryogenic, and superconducting gravity gradiometers with and without accelerometers. The application of superconducting cavity oscillators to mass-spring gradiometers, and cooperation of Italy's Piano Spaziale Nazionale with the Smithsonian Astrophysics Observatory in the design and development of a high sensitivity gradiometer are described. Schematics are provided for each instrument. A.R.H.

N84-18720*# Science Applications, Inc., McLean, Va.
SPACEBORNE GRAVITY GRADIOMETERS. PART 4: COMMON PROBLEMS
In its Spaceborne Gravity Gradiometers Mar. 1984 p 51-66
(For primary document see N84-18716 09-42)
Avail: NTIS HC A05/MF A01 CSCL 08N

Important issues and possible solutions in the development of gravity gradiometers are examined with emphasis on problems related to: (1) sensors (both) conventional and cryogenic; (2) laboratory, spacecraft environment, and orbital flight tests; (3) spacecraft design (attitude and vibration control, propulsion and tether systems, and cryogenic systems); and (4) on-board and ground data processing. A.R.H.

N84-18721*# Science Applications, Inc., McLean, Va.
SPACEBORNE GRAVITY GRADIOMETERS. PART 5: DEVELOPMENT PLAN
In its Spaceborne Gravity Gradiometers Mar. 1984 p 67-73
refs (For primary document see N84-18716 09-42)
Avail: NTIS HC A05/MF A01 CSCL 08N

The critical steps needed to develop a gravity gradiometer instrument and a conceptual design for a Gravity Gradiometer Mission (GGM) are defined and organized into a logical sequence. Funding requirements for an advanced development program beginning in FY-1985 are estimated. A.R.H.

N84-18722# National Academy of Sciences - National Research Council, Washington, D. C. Working Group on Geology.
EARTH SCIENCE INVESTIGATIONS IN THE UNITED STATES ANTARCTIC RESEARCH PROGRAM (USARP) Progress Report, 1 Jul. 1982 - 30 Jun. 1983
David H. Elliot, comp. 1983 101 p refs
(Grant NSF DPP-82-07009)
(PB84-119460) Avail: NTIS HC A06/MF A01 CSCL 08F

The report is a listing of earth science research activities conducted as part of the U.S. Antarctic Research Program for the year July 1, 1982, through June 30, 1983. Publications based on the research are also listed. Information was obtained by a survey of participants in the U.S. Antarctic Program, with respondents providing the data on their work in camera-ready format. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-18723* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 40
Jan. 1984 122 p
(NASA-SP-7041(40); NAS 1.21:7041(40)) Avail: NTIS HC $12.50 CSCL 05B

This bibliography lists 423 reports, articles, and other documents introduced into the NASA scientific and technical information system between October 1 and December 31, 1983. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economical analysis. E.A.K.

N84-18724# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTAL INVESTIGATION OF CHANNEL MEANDERING [EXPERIMENTELLE UNTERSUCHUNGEN ZUM RINNSALMAEANDER]
M. Sieber May 1983 84 p refs In GERMAN
(Rept-5/1983) Avail: NTIS HC A05/MF A01

The meandering of water flow on a 150 cm long and 90 cm wide plexiglass plate depending on the flow of G between 1 and 6 cm3/sec inclination Beta between 6 deg and 65 deg was investigated. The stability lines between straight and meandering channels was determined. A critical number was obtained in which the first lateral inclines occur. A total of 300 stabile meanders were photographed and digitalized by Fourier analysis. It is noted that stabile meanders do exist, from larger inclines, to smaller streams and become increasingly smaller. Transl. by E.A.K

N84-18725*# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
DATA DOCUMENTATION FOR THE BARE SOIL EXPERIMENT AT THE UNIVERSITY OF ARKANSAS, JUNE - AUGUST 1980
Ali M. Sadeghi Mar. 1984 71 p refs
(Grant NAG5-20)
(NASA-CR-173325; NAS 1.26:173325) Avail: NTIS HC A04/MF A01 CSCL 08M

The primary objective of this study is to evaluate the relationships between soil moisture and reflectivity of a bare soil, using microwave techniques. A drainage experiment was conducted on a Captina silt loam in cooperation with personnel in the Electrical Engineering Department. Measurements included soil moisture pressures at various depths, neutron probe measurements, gravimetric moisture samples, and reflectivity of the soil surface at selected frequencies including 1.5 and 6.0 GHz and at the incident angle of 45 deg. All measurements were made in conjuction with that of reflectivity data. B.W.

N84-18726*# Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
INVERSION ALGORITHMS FOR THE MICROWAVE REMOTE SENSING OF SOIL MOISTURE. EXPERIMENTS WITH SWEPT FREQUENCY MICROWAVES
Gary Duke Hancock and W. P. Waite Mar. 1984 147 p refs
(Grant NAG5-20)
(NASA-CR-173323; NAS 1.26:173323) Avail: NTIS HC A07/MF A01 CSCL 08M

Two experiments were performed employing swept frequency microwaves for the purpose of investigating the reflectivity from soil volumes containing both discontinuous and continuous changes in subsurface soil moisture content. Discontinuous moisture profiles were artificially created in the laboratory while continuous moisture profiles were induced into the soil of test plots by the environment of an agricultural field. The reflectivity for both the laboratory and field experiments was measured using bi-static reflectometers operated over the frequency ranges of 1.0 to 2.0 GHz and 4.0 to 8.0 GHz. Reflectivity models that considered the discontinuous and continuous moisture profiles within the soil volume were developed and compared with the results of the experiments. This comparison shows good agreement between the smooth surface models and the measurements. In particular the comparison of the smooth surface multi-layer model for continuous moisture profiles and the yield experiment measurements points out the sensitivity of the specular component of the scattered electromagnetic energy to the movement of moisture in the soil. Author

N84-18727# Army Engineer Topographic Labs., Fort Belvoir, Va.
THE AI RESEARCH ENVIRONMENT AT THE US ARMY ENGINEER TOPOGRAPHIC LABORATORIES
Robert D. Leighty Apr. 1983 9 p
(AD-A136316) Avail: NTIS HC A02/MF A01 CSCL 08/2

The U.S. Army Engineer Topographic Laboratories (USAETL) is responsible for Army research and development in the areas of mapping and terrain analysis. In general, this involves methods, techniques, and systems for information processing related to the extraction, analysis, and presentation of terrain data. Typically, the data source is aerial imagery and the real-world information processing techniques for aerial imagery are very labor-intensive. Previous research into automated techniques has not yielded results adequate to justify significant equipment developments necessary for future Army terrain information processing requirements. Thus, USAETL is making a significant commitment in AI with expectations for new and improved terrain information processing capabilities for the Army. This paper discusses the Artificial intelligence research environment at USAETL. This includes the rationale for the USAETL AI program, the objectives and approach of the Center for Artificial Intelligence (CAI), a description of the CAI AI facilities, and a brief description of the current CAI research program. GRA

N84-18728# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.

SIMULATION OF THEMATIC MAPPER DATA FOR REMOTE BATHYMETRY Final Technical Report, 20 Jul. 1982 - 20 Apr. 1983

F. J. Tanis, J. S. Ott, and T. Wessling Oct. 1983 67 p
(Contract N00014-82-C-2311)
(AD-A136377; ERIM-163100-7-F) Avail: NTIS HC A04/MF A01 CSCL 08/10

A preliminary algorithm has been developed for the extraction of water depths from Thematic Mapper (TM) scanner data. Algorithm development was based on 1978 aircraft scanner (ERIM M-8) data processed to simulate TM data, and on data available from the 1980 Photobathymetric Calibration Survey. The Defense Mapping Agency (DMA) constructed a series of overlays to the ERIM data set showing locations of ship soundings. These overlays were used as a basis to extract corresponding TM simulated signals from the aircraft data set. Water depth prediction algorithms were developed based upon relationships between the simulated TM data and the measured water depths. Results will aid the development of bathymetric processing procedures for Thematic Mapper data. Author (GRA)

N84-18729# Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.

OPERATIONAL SOIL MOISTURE PREDICTED MODEL Progress Report, No. 195, Oct. 1982 - May 1983

L. N. Gutman May 1983 5 p
(Contract DAJA37-81-C-0179)
(AD-A136381) Avail: NTIS HC A02/MF A01 CSCL 08/13

During the report period correction and improvement of the model 3 has been continued. The seeking and collecting of the observational data and also the writing of the first paper was begun. GRA

N84-18730# Army Engineer Topographic Labs., Fort Belvoir, Va.

A METHODOLOGY FOR DIGITAL PROCESSING OF GEOGRAPHIC AND CARTOGRAPHIC DATA

Richard L. Rosenthal, William Opalski, Douglas Caldwell, and Carl Reed (Autometric, Inc.) 1983 9 p
(AD-A135835; ETL-R050) Avail: NTIS HC A02/MF A01 CSCL 08/2

The application of computer technology to cartography has produced numerous digital techniques that are employed in a wide variety of independent automated and semi-automated cartographic systems. These systems are used by government agencies and private industry for compiling maps and charts. The US Army Engineer Topographic Laboratories (USAETL) is testing and evaluating a subset of available off-the-shelf and state-of-the-art R&D digital techniques in an Experimental Geo-Cartographic Laboratory System and developing a methodology for automated map and chart production. The methodology, which is based upon geographic and cartographic principles, is defined and outlined in this paper along with early experimental results derived from the integration of key hardware/software systems. GRA

N84-18731# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

CONSTRUCTING A DEPTH MAP FROM IMAGES

K. Ikeuchi Aug. 1983 20 p
(Contracts N00014-80-C-0505; N00014-77-C-0389)
(AD-A135679; AI-M-744) Avail: NTIS HC A02/MF A01 CSCL 08/2

This paper describes two methods for constructing a depth map from images. Each method has two stages. First, one or more needle maps are determined using a pair of images. This process employs either the Marr-Poggio-Grimson stereo and shape from shading, or, instead, photometric stereo. Secondly, a depth map is constructed from the needle map or needle maps computed by the first stage. Both methods make use of an iterative relaxation method to obtain the final depth map. Author (GRA)

N84-18732# INTERA Environmental Consultants Ltd., Houston, Tex.

ADJOINT SENSITIVITY THEORY FOR STEADY-STATE GROUND-WATER FLOW

J. Sykes, J. L. Wilson, and R. Andrews Nov. 1983 81 p refs
(Contracts DE-AC06-76RL-01830; DE-AC02-83CH-10140; EY-76-C-06-1830)
(DE84-003335; BMI/ONWI-515) Avail: NTIS HC A05/MF A01

Adjoint sensitivity theory was developed for equations of two dimensional steady state flow in a confined aquifer. Both the primary flow equation and the adjoint sensitivity equation are solved using the Galerkin finite element method. The developed computer code is used to investigate the regional flow parameters of the Leadville Formation of the Paradox Basin in Utah and the Wolcamp carbonate/sandstone aquifer of the Palo Duro Basin in the Texas Panhandle. Two performance measures are evaluated, local heads and velocity in the vicinity of potential high level nuclear waste repositories. The sensitivity of calculated local heads to the boundary conditions are illustrated. Local velocity related performance measures are more sensitive to hydraulic conductivities. The uncertainty in the performance measure is a function of the parameter sensitivity, parameter variance and the correlation between parameters. Given a parameter covariance matrix, the uncertainty of the performance measure can be calculated. The implications of uncertainty calculations for the two studies are discussed. DOE

N84-18733# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.

ON THE DIELECTRIC PROPERTIES OF DRY SNOW IN THE 800 MHz TO 13 GHz RANGE

Ebbe Nyfors 1982 20 p refs
(Rept-S-135; ISBN-951-752-762-4; ISSN-0355-5712) Avail: NTIS HC A02 A01

The dielectric constant of dry snow was measured, and dependence on temperature, density and frequency were studied. Acidity is also found to influence the imaginary part of the dielectric constant. The measurements were made using cylindrical cavity resonators operating on the TE011 mode. The 850 MHz, 1.9, 5.6 and 12.6 MHz frequencies were used. The real part is found to depend only on density. The imaginary part has a minimum at 3 GHz. Author (ESA)

N84-18734# Bureau of Reclamation, Billings, Mont.

RESOURCE AND POTENTIAL RECLAMATION EVALUATION: NORTHEAST MONTANA INVESTIGATIONS Final Report

Frank Calcagno, Jr., ed. and Glenn H. Westman, ed. Jul. 1983 205 p refs
(PB84-112390; BLM-YA-533) Avail: NTIS HC A10/MF A01 CSCL 13B

The purpose of this investigation was to collect baseline information for establishing reclamation objectives and lease stipulations. The investigations area, located in northeastern Montana, lies on the border of the glaciated and unglaciated portion

of the Great Plains Physiographic Province. Climatic conditions are characterized by cold winters, warm summers, and large variations in seasonal precipitation. Bedrock exposed in the area consists predominantly of the Tongue River Member and also the Lebo Shale Member of the Paleocene Fort Union Formation. Six continuous lignite beds are present in the area, of which four are fairly thick. Soils developing in old or recent alluvium in the area should provide 18 to 36 inches or more of good quality topsoiling material for revegetation. Overburden samples from 9 drill holes were evaluated for use as a supplemental plant medium for revegetation. GRA

N84-18735# Bureau of Reclamation, Billings, Mont.
RESOURCE AND POTENTIAL RECLAMATION EVALUATION: NORTHEAST MONTANA INVESTIGATIONS Final Report
Frank Calcagno, Jr., ed. and Glenn H. Westman, ed. Jul. 1983 41 p
(PB84-112408; BLM-YA-533-S) Avail: NTIS HC A03/MF A01 CSCL 13B

The purpose of this investigation was to collect baseline information for establishing reclamation objectives and lease stipulations. The investigations area, located in northeastern Montana, lies on the border of the glaciated and unglaciated portion of the Great Plains Physiographic Province. Climatic conditions are characterized by cold winters, warm summers, and large variations in seasonal precipitation. Six continuous lignite beds are present in the area, of which four are fairly thick. Soils developing in old or recent alluvium in the area should provide 18 to 36 inches or more of good quality topsoiling material for revegetation. Overburden samples from drill holes were evaluated for use as a supplemental plant medium for revegetation. GRA

N84-18736# Geological Survey, Trenton, N.J. Water Resources Div.
WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1982. VOLUME 1: ATLANTIC SLOPE BASINS, HUDSON RIVER TO CAPE MAY Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
W. R. Bauersfeld, E. W. Moshinsky, E. A. Pustay, and F. L. Schaefer Jun. 1983 341 p refs 2 Vol.
(PB84-119726; USGS/WRD/HD-82-056; USGS-WRD-NJ-82-1) Avail: NTIS HC A15/MF A01 CSCL 08H

Water Resources data for the 1982 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume of the report contains discharge records for 77 gaging stations; tide summaries for one station; stage and contents for 15 lakes and reservoirs; water quality for 76 surface-water sites and 158 wells; and water levels for 49 observation wells. Also included are data for 42 crest-stage partial-record stations; 17 tidal crest-stage gages; and 37 low-flow partial-record stations. GRA

N84-18737# Geological Survey, Trenton, N.J. Water Resources Div.
WATER RESOURCES DATA FOR NEW JERSEY, WATER YEAR 1982. VOLUME 2: DELAWARE RIVER BASIN AND TRIBUTARIES TO DELAWARE BAY Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
W. R. Bauersfeld, E. W. Moshinsky, E. A. Pustay, and F. L. Schaefer Jun. 1983 220 p refs 2 Vol.
(PB84-119734; USGS/WRD/HD-82-057; USGS-WRD-NJ-82-2) Avail: NTIS HC A10/MF A01 CSCL 08H

Water resources data for the 1982 water year for New Jersey consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume of the report contains discharge records for 21 gaging stations; tide summaries for 3 stations; stage and contents for 16 lakes and reservoirs; water quality for 58 surface water sites and 78 wells; and water levels for 23 observation wells. Also included are data for 27 crest-stage partial-record stations, 7 tidal crest-stage gages, and 26 low-flow partial-record stations. GRA

N84-18738# Geological Survey, Urbana, Ill. Water Resources Div.
WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1982. VOLUME 1: ILLINOIS EXCEPT ILLINOIS RIVER BASIN Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
R. L. Stahl, K. K. Fitzgerald, T. E. Richards, and P. D. Hayes Jul. 1983 507 p refs 2 Vol.
(PB84-120112; USGS/WRD/HD-82/071; USGS-WRD-IL-82-1) Avail: NTIS HC A22/MF A01 CSCL 08H

Water resources data for the 1982 water year for Illinois consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels of ground-water wells. This volume contains records for water discharge at 92 gaging stations; stage at 17 gaging stations; stage and contents at 3 lakes and reservoirs; stage only at 1 lake station; and water quality at 117 gaging stations. Also included are data for 11 crest-stage partial-record stations. GRA

N84-18739# Geological Survey, Urbana, Ill. Water Resources Div.
WATER RESOURCES DATA FOR ILLINOIS, WATER YEAR 1982. VOLUME 2: ILLINOIS RIVER BASIN Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
T. E. Richards, P. D. Hayes, R. L. Stahl, and K. K. Fitzgerald Jul. 1983 412 p refs 2 Vol.
(PB84-120120; USGS/WRD/HD-82/072; USGS-WRD-IL-82-2) Avail: NTIS HC A18/MF A01 CSCL 08H

Water resources data for the 1982 water year for Illinois consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels of ground-water wells. This volume contains records for water discharge at 83 gaging stations; stage only at 2 gaging stations; stage only at 3 lake stations; water quality at 96 gaging stations; and water levels at 3 observation wells. Also included are data for 18 crest-stage partial-record stations. GRA

N84-18740# Geological Survey, Idaho Falls, Idaho. Water Resources Div.
WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1982. VOLUME 1: GREAT BASIN AND SNAKE RIVER BASIN ABOVE KING HILL Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
R. W. Harper, H. G. Sisco, I. ODell, and S. C. Cordes Jul. 1983 346 p refs 2 Vol.
(PB84-118470; USGS/WRD/HD-82/064; USGS-WRD-ID-82-1) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for the 1982 water year for Idaho consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of ground water. This report in two volumes contains discharge records for 192 gaging stations; stage only records for 2 gaging stations; stage only for 10 lakes and reservoirs; contents only for 11 lakes and reservoirs; water quality for 27 gaging stations, 38 partial-record stations, 143 wells; and water levels or 458 observation wells. GRA

N84-18741# Geological Survey, Idaho Falls, Idaho. Water Resources Div.
WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1982. VOLUME 2: UPPER COLUMBIA RIVER BASIN AND SNAKE RIVER BASIN BELOW KING HILL Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
R. W. Harper, H. G. Sisco, I. ODell, and S. C. Cordes Jul. 1983 306 p refs 2 Vol.
(PB84-118488; USGS/WRD/HD-82/065; USGS-WRD-ID-82-2) Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1982 water year for Idaho consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water. This report in two volumes contains discharge records for 192 gaging stations; stage only records for 2 gaging stations; stage only for 10 lakes and reservoirs; contents only for 11 lakes and reservoirs; water quality for

27 gaging stations, 38 partial-record stations, 143 wells; and water levels for 458 observation wells. GRA

N84-18742# Geological Survey, Albany, N.Y. Water Resources Div.
WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1982. VOLUME 2: LONG ISLAND Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
A. G. Spinello, J. H. Nakao, W. J. Flipse, Jr., and J. G. Carcaci Jul. 1983 322 p refs 3 Vol.
(PB84-119536; USGS/WRD/HD-83/037; USGS-WRD-NY-82-2)
Avail: NTIS HC A14/MF A01 CSCL 08H

Water resources data for the 1982 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; water quality of precipitation; and water levels and water quality of ground water wells. Records for water discharge at 17 gaging stations; water quality at 17 gaging stations, 349 wells, and 3 precipitation stations and water levels at 117 observation wells are discussed. Also included are data for 77 low flow partial record stations. GRA

N84-18743# Geological Survey, Lakewood, Colo. Water Resources Div.
WATER RESOURCES DATA FOR COLORADO, WATER YEAR 1982. VOLUME 3: DOLORES RIVER BASIN, GREEN RIVER BASIN, AND SAN JUAN RIVER BASIN Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
J. T. Steinheimer, R. C. Ugland, H. E. Burch, and E. A. Wilson May 1983 378 p refs 3 Vol.
(PB84-120146; USGS/WRD/HD-82-054; USGS-WRD-CO-82-3)
Avail: NTIS HC A17/MF A01 CSCL 08H

Water-resources data for Colorado for the 1982 water year consists of records of stage, discharge, and water quality of streams; stage, contents and water quality of lakes and reservoirs, and water levels and water quality of wells and springs. Discharge records for 408 gaging stations, stage and contents of 27 lakes and reservoirs, 6 partial record low-low stations, peak flow information for 30 crest stage partial-record stations, and 50 miscellaneous sites; water quality for 163 gaging stations and 245 miscellaneous sites; and water levels for 55 observation wells are included. GRA

N84-18744# Geological Survey, Albany, N.Y. Water Resources Div.
WATER RESOURCES DATA FOR NEW YORK, WATER YEAR 1982. VOLUME 1: EASTERN NEW YORK EXCLUDING LONG ISLAND Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
T. J. Zembrzuski, Jr., P. M. Burke, R. J. Archer, and J. A. Robideau Aug. 1983 279 p refs 2 Vol.
(PB84-114198; USGS/WRD/HD-83/036; USGS-WRD-NY-82-1)
Avail: NTIS HC A13/MF A01 CSCL 08H

Water resources data for the 1982 water year for New York consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; quality of precipitation; and water levels of ground water wells. This volume contains records for water discharge at 99 gaging stations; stage only at 5 gaging stations; and stage and contents at 4 gaging stations; and 19 other lakes and reservoirs; water quality at 25 gaging stations, 5 precipitation stations and water levels at 23 observation wells. Also included are data for 51 crest stage and 9 low flow partial record stations. GRA

N84-18745# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
GREAT LAKES MONTHLY HYDROLOGIC DATA
Frank H. Quinn and Raymond N. Kelley Aug. 1983 87 p refs
(PB84-114545; NOAA-DR-ERL-GLERL-26; NOAA-83102801)
Avail: NTIS HC A05/MF A01 CSCL 08H

This report summarizes the monthly hydrologic data currently used by the Great Lakes Environmental Research Laboratory in their hydrologic and water resource studies of the Great Lakes. The data consist of precipitation, runoff, evaporation, connecting channel flows, diversions, beginning of month lake levels, and rates of change in storage. Author (GRA)

N84-18746# Geological Survey, San Juan (Puerto Rico). Water Resources Div.
WATER RESOURCES DATA FOR PUERTO RICO, 1981 - 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
Russell E. Curtis, Patrick W. McKinley, and Hector M. Colon-Ramos Mar. 1983 410 p refs
(PB84-114701; USGS/WRD/HD-02-027; USGS-WRD-PR-82-1)
Avail: NTIS HC A18/MF A01 CSCL 08H

Water-resources data for surface-water, quality-of-water, and ground-water records for 1981-82 water years for Puerto Rico consist of records of discharge, water quality of streams, and water levels of wells. This report contains discharge and water-quality records for 40 gaging stations, 109 water-quality stations, stage records for 3 lakes, and water levels for 61 observation wells. Also included are data for 17 crest-stage partial-records stations. GRA

N84-18747# Geological Survey, Indianapolis, Ind. Water Resources Div.
WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
R. L. Miller, R. E. Hoggatt, and G. E. Nell Jul. 1983 356 p refs
(PB84-114990; USGS/WRD/HD-83/063; USGS-WRD-IN-82-1)
Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1982 water year for Indiana consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 176 gaging stations, stage and contents for 9 lakes and reservoirs, releases from 8 flood control reservoirs, water quality for 26 gaging stations, and water levels for 87 observation wells. Also included are 71 crest-stage partial-record stations. GRA

N84-18748# Geological Survey, Huron, S. Dak. Water Resources Div.
WATER RESOURCES DATA FOR SOUTH DAKOTA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
E. B. Hoffman, N. F. Leibbrand, D. R. Winter, and J. R. Little Sep. 1983 308 p refs
(PB84-117175; USGS/WRD/HD-83/076; USGS-WRD-SD-82-1)
Avail: NTIS HC A14/MF A01 CSCL 04H

Water resources data for the 1982 water year for South Dakota consists of records of stage, discharge, and water quality of stream; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 110 gaging stations; stage and contents for 14 lakes and reservoirs; water quality for 32 gaging stations; and water levels for 8 observation wells. GRA

N84-18749# Geological Survey, Helena, Mont. Water Resources Div.
WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1982. VOLUME 1: HUDSON BAY BASIN, MISSOURI RIVER BASIN Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
R. R. Shields, J. R. Knapton, M. K. White, M. A. Jacobson, and M. L. Kasman Jul. 1983 568 p refs 2 Vol.
(PB84-117506; USGS/WRD-HD-83/075; USGS-WRD-MT-82-1)
Avail: NTIS HC A24/MF A01 CSCL 08H

Water resources data for the 1982 water year for Montana consist of records of stage, discharge, and water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 189 gaging stations; stage only records for 1 lake station; stage/contents for 6 lakes and reservoirs; water quality for 86 stations; water levels for 9 observation wells. Also included are 140 crest-stage partial-record stations and 33 smaller reservoirs. GRA

N84-18750# Geological Survey, Baton Rouge, La. Water Resources Div.
WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1982. VOLUME 1: CENTRAL AND NORTHERN LOUISIANA Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
D. D. Carlson, G. R. Stallworth, L. J. Dantin, and C. G. Stuart Jul. 1983 434 p refs 2 Vol.
(PB84-118546; USGS/WRD/HD-82/066; USGS-WRD-LA-82-1)
Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for the 1982 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, in two volumes, contains records for water discharge at 77 gaging stations (including stage for 65 of these stations); stage only for 64 gaging stations and 9 lakes; contents for 1 reservoir; water quality for 104 surface water stations (including 31 gaging stations) 20 miscellaneous sites, and 8 lakes, and 223 wells; and water levels for 526 observation wells. Also included are data for 209 crest-stage and flood profile partial record stations. GRA

N84-18751# Geological Survey, Richmond Va. Water Resources Div.
WATER RESOURCES DATA FOR VIRGINIA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
Byron J. Prugh, Fred J. Easton, and Dennis D. Lynch May 1983 470 p refs
(PB84-118553; USGS/WRD/HD-83-049; USGS-WRD-VA-82-1)
Avail: NTIS HC A20/MF A01 CSCL 08H

Water resources data for the 1982 water year for Virginia consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground-water wells. This volume contains records for water discharge at 200 gaging stations; stage only at 1 gaging station; stage and contents at 10 lakes and reservoirs; water quality at 32 gaging stations and 8 wells; and water levels at 59 observation wells. Also included are data for 73 crest-stage partial-record stations. GRA

N84-18752# Geological Survey, Helena, Mont. Water Resources Div.
WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1982. VOLUME 2: COLUMBIA RIVER BASIN Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
R. R. Shields, J. R. Knapton, M. K. White, M. A. Jacobson, and M. L. Kasman Jun. 1983 194 p refs
(PB84-118561; USGS/WRD/HD-83/055; USGS-WRD-MT-82-2)
Avail: NTIS HC A09/MF A01 CSCL 08H

Water resources data for the 1982 water year for Montana consist of records of stage, discharge, and water quality of streams; stage, contents and water quality of lakes and reservoirs; and water levels in wells. Volume 2 of this report contains discharge records for 46 gaging stations; stage/contents for 3 lakes and reservoirs; water quality for 19 stations, 3 lakes; and water levels for 14 observation wells. Also included are 31 crest stage partial-record stations and 20 smaller reservoirs. GRA

N84-18753# Geological Survey, Anchorage, Alaska. Water Resources Div.
WATER RESOURCES DATA FOR ALASKA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
Jun. 1983 372 p refs
(PB84-119569; USGS/WRD/HD-82/059; USGS-WRD-AD-82-1)
Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1982 water year for Alaska consists of records of stage, discharge, and water quality of streams; stage and water quality of lakes; and water levels and water quality in wells and springs. This report contains discharge records for 108 gaging stations; stage only record for 1 gaging station; water quality for 49 stations; and water levels for 28 observation wells. Also included are 43 low-flow, 67 crest-stage, and 48 water-quality partial-record stations. GRA

N84-18754# Geological Survey, Charleston, W. Va. Water Resources Div.
WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
W. N. Embree, E. A. Friel, T. A. Ehlke, and S. M. Ward Aug. 1983 354 p refs
(PB84-120161; USGS/WRD/HD-82/074; USGS-WRD-WV-82-1)
Avail: NTIS HC A16/MF A01 CSCL 08H

Water resources data for the 1982 water year for West Virginia consist of records of stage, discharge, and water quality of streams and springs; stage and contents of lakes and reservoirs; and water levels in wells. This report contains discharge records for 116 gaging stations; stage only records for 9 gaging stations; stage and contents for 8 lakes and reservoirs; contents for 1 reservoir; change in contents for 1 reservoir; water quality for 55 gaging stations; and water levels for 29 observation wells. Also included are 2 crest stage partial-record stations, and 1 low-flow partial record station. GRA

N84-18755# Geological Survey, Carson City, Nev. Water Resources Div.
WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
Howard R. Frisbie, Richard J. LaCamera, Margaret M. Riek, and David B. Wood Jul. 1983 366 p refs
(PB84-120385; USGS/WRD/HD-83/067; USGS-WRD-NV-82-1)
Avail: NTIS HC A16/MF A01 CSCL 08H

Water-resources data published herein for the 1982 water year in Nevada comprise the following records: Water discharge for 120 gaging stations on streams, canals, and drains; discharge data for 40 peak-flow stations and 5 low-flow stations on steams; stage and contents for 21 lakes and reservoirs; water levels for 229 observation wells; water-quality data for 93 stream, canal, and drain sites, 13 lake and reservoir sites, and 2 wells. GRA

N84-18756# Geological Survey, Salt Lake City, Utah. Water Resources Div.
WATER RESOURCES DATA FOR UTAH, WATER YEAR 1982 Annual Water-data Report, 1 Oct. 1981 - 30 Sep. 1982
Michael D. ReMillard, Glenn C. Anderson, Ezra Hookano, Jr., and George W. Sandberg May 1983 514 p refs
(PB84-120484; USGS/WRD/HD-82/048; USGS-WRD-UT-82-1)
Avail: NTIS HC A22/MF A01 CSCL 08H

Water resources data for the 1982 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 233 gaging stations; stage and contents for 19 lakes and reservoirs; water quality for 45 hydrologic stations, and 185 wells; miscellaneous temperature measurements and field determinations for 167 stations; and water levels for 39 observation wells. GRA

N84-18258# Joint Publications Research Service, Arlington, Va.
COSMOS-1500 SLR USED FOR ARCTIC ICE RECONNAISSANCE
V. Shmyganovskiy *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 74-76 Transl. into ENGLISH from Izv. (Moscow), 6 Nov. 1983 p 6 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

N84-18799# Meteorological Satellite Center, Tokyo (Japan).
ANALYSIS OF SEA ICE IN THE SEA OF OKHOTSK USING LANDSAT-MSS DATA (COMPARISON WITH GMS DATA)
Takaaki Kimura *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 41-59 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

N84-18800# Meteorological Satellite Center, Tokyo (Japan).
PARTIAL LEVEL DOWN IN BRIGHTNESS OF GEOSTATIONARY METEOROLOGICAL SATELLITE (GMS) INFRARED (IR) IMAGES CAUSED BY THE MOON

Gunji Hirooka *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 61-66 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-18757*# Little (Arthur D.), Inc., Cambridge, Mass.
NEW APPLICATIONS FOR PHOSPHORIC ACID FUEL CELLS Final Report
R. P. Stickles and C. T. Breuer Nov. 1983 225 p refs
(Contracts DEN3-291; DE-AI21-80ET-17088)
(NASA-CR-168203; DOE/NASA/0291-1; NAS 1.26:168203; ADL-88036) Avail: NTIS HC A10/MF A01 CSCL 10A

New applications for phosphoric acid fuel cells were identified and evaluated. Candidates considered included all possibilities except grid connected electric utility applications, on site total energy systems, industrial cogeneration, opportunistic use of waste hydrogen, space and military applications, and applications smaller than 10 kW. Applications identified were screened, with the most promising subjected to technical and economic evaluation using a fuel cell and conventional power system data base developed in the study. The most promising applications appear to be the underground mine locomotive and the railroad locomotive. Also interesting are power for robotic submersibles and Arctic villages. The mine locomotive is particularly attractive since it is expected that the fuel cell could command a very high price and still be competitive with the conventionally used battery system. The railroad locomotive's attractiveness results from the (smaller) premium price which the fuel cell could command over the conventional diesel electric system based on its superior fuel efficiency, and on the large size of this market and the accompanying opportunities for manufacturing economy. Author

N84-18758*# Naval Weapons Support Center, Crane, Ind. Weapons Quality Engineering Center.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS. INITIAL EVALUATION TESTS OF GENERAL ELECTRIC COMPANY 4.0 AMPERE-HOUR NICKEL-CADMIUM SPACECRAFT CELLS FOR THE AMPTE SATELLITE PROGRAM
J. D. Harkness [1984] 18 p
(NASA Order S-5705-AG)
(NASA-CR-173357; NAS 1.26:173357; WQEC/C-83-428) Avail: NTIS HC A02/MF A01 CSCL 10C

Cells found to have electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open circuit voltage above 1.150 volts during the internal short test are addressed. The Active Magnetic Particle Tracer Explorer (AMPTE) cell design was characterized and the effects of specific mission parameters on cell life were demonstrated. N.W.

N84-18759*# Naval Weapons Support Center, Crane, Ind. Weapons Quality Engineering Center.
QUALIFICATION EVALUATION TESTS OF 20.0 AMPERE-HOUR SEALED NICKEL-CADMIUM CELLS Final Report
J. D. Harkness 7 Jun. 1983 293 p
(NASA-CR-173358; NAS 1.26:173358; WQEC/C-83-133) Avail: NTIS HC A13/MF A01 CSCL 10C

Low Earth orbit cycle, synchronous orbit cycle, general performance, and vibration test results, and gas analyses are reported. N.W.

N84-18760# Los Alamos Scientific Lab., N. Mex. Solar Energy Group.
PASSIVE SOLAR DESIGN PROCEDURES FOR NAVAL INSTALLATIONS Interim Contract Report
William O. Wray, Franz A. Biehl, and Claudia E. Kosiewicz Sep. 1983 116 p
(Contracts N68305-82-MP-20006; N68305-82-MP-20010)
(AD-A136329; NCEL-CR-83.040) Avail: NTIS HC A06/MF A01 CSCL 13/1

The energy efficiency of buildings at Naval installations can be greatly improved through the use of passive solar heating strategies. These strategies may be applied to many existing buildings that are suitable for retrofit and are universally applicable to new construction. The purpose of this design procedure is to provide the tools required by professionals involved in building design and/or evaluation who wish to improve the energy efficiency of buildings by use of passive solar heating. Three types of tools are provided. First, a general discussion of the basic concepts and principles of passive solar heating is presented to familiarize the reader with this relatively new technology. Second, a set of guidelines are presented for use during schematic design that will enable the user to quickly define a building that will perform in a cost-effective manner at the intended building site. Finally, a quantitative design-analysis procedure is presented that provides the user with an accurate estimate of the auxiliary heating requirements of a given passive solar design. This procedure is presented that provides the user with an accurate estimate of the auxiliary heating requirements of a given passive solar design. This procedure may be used to refine or fine tune a preliminary design based on the schematic-design guidelines or may be used during proposal evaluation to compare the merits of various candidate designs. Author (GRA)

N84-18761# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DISCHARGING A SUPERCONDUCTING STORE INTO AN INVERTING CONVERTER
V. V. Andrianov, V. B. Zenkevich, O. V. Popkov, B. N. Sergeyenkov, and A. G. Sukhorukov 8 Nov. 1983 11 p Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 196, no. 2, 1971 p 320-323
(AD-A135577; FTD-ID(RS)T-1186-83) Avail: NTIS HC A02/MF A01 CSCL 10/2

It is possible to invert the energy stored in a superconducting solenoid with both a constant mean value of the inverted power, and a constant mean value of the voltage in the leads of the solenoid, which is equal to the mean value of the opposing voltage (counter emf) of the inverter. The operation of a superconducting inductive store together with a high speed semiconductor switch and a three phase inverter is considered. Graphs show changes in currents and voltages on the compacitor, the current flowing through the superconducting solenoid, the current flowing through the capacitor, and that flowing through the controlled rectified. A.R.H.

N84-18762# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THYRISTOR CONVERTER FOR CAPACITIVE LASER ACCUMULATORS
G. L. Benediktov 1 Dec. 1983 11 p Transl. into ENGLISH from Poluprov. Pribory v Teknike Elektr. (USSR), no. 5, 1970 p 177-182
(AD-A136051; FTD-ID(RS)T-1337-83) Avail: NTIS HC A02/MF A01 CSCL 10/2

Theoretical and experimental investigations showed the possibility of construction of a thyristor converter for power supply of capacitive accumulators of gas-discharge lamps for a laser with provision for constancy of power consumed from the power source. The curves given for the law of change of energy depending on voltage on the accumulator capacitance and the expressions for current and voltage in the charging circuit make it possible to make an engineer calculation of the circuit of the thyristor converter. The proposed method of calculating the process of charging of a

capacitive accumulator can be used for the calculation of a circuit, providing other laws of change of power in time which differ from the law P=const. R.J.F.

N84-18763# Oak Ridge National Lab., Tenn. Chemistry Div.
CHEMICAL REACTIONS POSSIBLY USEFUL FOR LOW TEMPERATURE THERMAL ENERGY STORAGE
J. S. Johnson, Jr. and C. G. Westmoreland Nov. 1983 25 p refs
(Contract W-7405-eng-26)
(DE84-004126; ORNL/TM-8963) Avail: NTIS HC A02/MF A01

Several systems were evaluated for possible enhanced storage of heat in the temperature range from ambient to about 600C. Solutions of a hydrolyzable inorganic ion, polymers with hydrophilic and hydrophobic constituents, organic compounds melting in the range, and fluorinated organics were included. Inorganic hydrolysis seems definitely not useful. No specific embodiments of particular interest are identified in the other classes. DOE

N84-18456# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DYNAMIC ANALYSIS OF A BEARING AND POWER TRANSFER ASSEMBLY (BAPTA) SOLAR GENERATOR SYSTEM
C.-Ch. Etzler *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 11-17 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18457# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
DESIGN AND DEVELOPMENT OF AN ADVANCED SOLAR ARRAY DRIVE MECHANISM
J. S. Sheppard *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 19-26 refs (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-18764*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRBORNE MEASUREMENTS OF LAUNCH VEHICLE EFFLUENT OF STS-2 LAUNCH ON NOVEMBER 12, 1981 AT CAPE CANAVERAL, FLORIDA
George L. Maddrea, Jr., Gerald L. Gregory, Daniel I. Sebacher, and David C. Woods Feb. 1984 47 p ref
(NASA-TP-2260; L-15715; NAS 1.60:2260) Avail: NTIS HC A03/MF A01 CSCL 13B

The second Space Shuttle (STS-2) was launched from the John F. Kennedy Space Center at 1010 EST on November 12, 1981. An instrumented light airplane was used to measure the emitted concentration of Shuttle exhaust products produced during launch. The airplane accomplished 31 passes through and under the exhaust cloud in the 1 hr 45 min immediately following the launch. Measurements included the following: (1) particulate data in the form of a light scattering coefficient obtained from an integrating nephelometer, (2) particulate concentrations and mass concentrations obtained from a spectrometer probe, (3) gaseous HCl and total HCl concentrations obtained from a gas-filter-correlation instrument and a chemiluminescent instrument, respectively, and (4) outside-air temperature and dew-point temperature. These data are presented along with time, altitude, and position for each cloud pass. These data are within the range of values observed during similar measurements made during the first Space Shuttle launch on April 12, 1981. Author

N84-18765# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRELIMINARY ANALYSIS OF RESULTS OF A MOUNTAIN AREA ATMOSPHERIC DIFFUSION TEST
8 Dec. 1983 38 p Transl. into ENGLISH from unknown Chinese report p 26-35
(AD-A136502; FTD-ID(RS)T-1637-83) Avail: NTIS HC A03/MF A01 CSCL 13/2

The results of diffusion test of artificial smoke clouds and neutron activated smoke were used to calculate the atmospheric diffusion parameters especially focusing on the differences of the diffusion diluting capabilities of the pollutants and comparing them with related foreign results where upon useful results were obtained. Author

N84-18766# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex. Environmental Quality Branch.
ENVIRONMENTAL MONITORING INSTRUMENTATION AND MONITORING TECHNIQUES FOR SPACE SHUTTLE LAUNCHES Final Report, Jan. 1982 - Jul. 1983
Gerald D. Swoboda and Dennis F. Naugle Jul. 1983 86 p
(AD-A136594; OEHL-83-216EQ195GEF) Avail: NTIS HC A05/MF A01 CSCL 14/2

The Space Shuttle emits undesired exhaust materials into the atmosphere during a launch including large quantities of hydrogen chloride (HCl). The fate of the HCl is not well understood but includes deposition and HCl gas revolatilization near the launch pad and downwind acid washout, acid rainout and HCl gas dispersion. The Air Force and NASA began monitoring missile exhaust effluents in the early 1970s. There has been an evolution in monitoring instrumentation, monitoring techniques and monitoring schemes developed jointly by the Air Force and NASA culminating in the efforts for Space Shuttle launches at Kennedy Space Center. This report reviews and evaluates these efforts and recommends an integrated program of ground monitors, aircraft monitors and remote sensors to monitor shuttle exhaust materials. Author (GRA)

N84-18767# National Aeronautical Establishment, Ottawa (Ontario).
FLIGHT TESTS OF INSTRUMENTATION FOR AIRBORNE CARBON DIOXIDE FLUX MEASUREMENT
J. I. MacPherson Oct. 1983 56 p
(AD-A135856; NAE-AN-16; NRC-22751) Avail: NTIS HC A04/MF A01 CSCL 04/1

At the request of Agriculture Canada, the Flight Research Laboratory of the National Aeronautical Establishment (NAE) has operated the Twin Otter atmospheric research aircraft fitted with a CO2 analyzer in order to assess the feasibility of making airborne carbon dioxide flux measurements. This report will summarize progress to date and present an analysis of the data collected during a series of nine test flights in August and September, 1982. The experimental results show that it is possible to make realistic measurements of the heat and CO2 fluxes from an aircraft instrumented to measure vertical gusts. Special tests and analysis procedures were conducted to investigate the accuracy of the carbon dioxide measurements. Recommendations for improvements in the design of future test programs are made.
Author (GRA)

N84-18768# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Sciences Div.
OPTICAL MEASUREMENT OF SO/SUB 2 IN COMBUSTION ENVIRONMENTS
Donald Lucas and Nancy J. Brown Oct. 1983 5 p Presented at the 26th ORNL-DOE Conf. on Anal. Chem. in Energy Technol., Knoxville, Tenn., 11-13 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-002927; LBL-16741; CONF-831025-27) Avail: NTIS HC A02/MF A01

Sulfur dioxide was measured in a high temperature combustion environment by ultraviolet absorption spectroscopy and by tunable atomic line molecular spectroscopy (TALMS). Measurements are made in the postflame region of a flat flame burner using stoichiometric and lean methane/air mixtures doped with SO2.
DOE

N84-18769# Argonne National Lab., Ill. Environmental Research Div.
ACIDIC DEPOSITION EFFECTS ON VEGETATION: A REVIEW AND ANALYSIS OF METHODOLOGY
Patricia M. Irving 1983 37 p refs Presented at the VDI Soc. of German Engr. Conf. on Precipitation, Lindau, West Germany, 7 Jun. 1983
(Contract W-31-109-eng-38)
(DE84-004014; CONF-830662-2) Avail: NTIS HC A03/MF A01

Acid rain was implicated as an agent which may potentially impact vegetative growth. Many hypotheses were published regarding long term acid rain damage to forests and croplands, there are, however, few research results to directly support conclusive estimations of impact. The approach and techniques used by researchers examining the vegetative impacts of acid rain is presented are described. DOE

N84-18770# Delaware Univ., Newark. Coll. of Agricultural Sciences.
ASSESSMENT OF ACID RAIN ON LEACHING OF ELEMENTS FROM DELAWARE SOILS INTO GROUNDWATER
D. L. Sparks and C. R. Curtis 1983 22 p refs
(Contract DI-14-34-0001-2108)
(PB84-120849; W84-00434; OWRT-A-053-DEL(1)) Avail: NTIS HC A02/MF A01 CSCL 08M

The effects of acid rain on the kinetics of elemental release from three major Delaware soil types were investigated. All three soils contained low clay and organic matter contents which would indicate rather low buffering capacities. The kinetics of elemental release were evaluated by leaching the soils with simulated acid rain at pH levels of 2.5, 3.4, 4.8, and 5.6. Leachates were collected until an apparent equilibrium in elemental release was obtained. In all soils and at all acid rain pH levels, quantities of basic elemental release were in the order Ca K Mg Na. The amount of heavy metals and Si release were very low. As the pH of the acid rain decreased, the total quality of each released element increased. In all cases, a rapid initial release of each element was followed by slower release rates. The kinetics of Al release were characterized by a similar time trend. Author (GRA)

N84-18771# National Center for Atmospheric Research, Boulder, Colo. Environmental and Societal Impacts Group.
EVALUATION OF PERFORMANCE MEASURES FOR AN URBAN PHOTOCHEMICAL MODEL
Robin L. Dennis, Mary W. Downton, and Robbi S. Keil Jul. 1983 221 p refs
(PB84-115062; EPA-450/4-83-021) Avail: NTIS HC A10/MF A01 CSCL 13B

A workshop conducted by the American Meteorological Society for EPA in September 1980 recommended a large set of statistical measures for use in the evaluation of air quality models. The present study was designed to test the recommended measures in an actual performance evaluation of an airshed model on data developed for Denver, Colorado. Three versions of the SAI Urban Airshed Model were examined. The study involved both an evaluation of the models and an evaluation of the statistical performance measures. The evaluation of the models had two parts--a base year case and an emission trend case, the latter representing the use of the models for regulatory purposes. GRA

N84-18772# Calspan Advanced Technology Center, Buffalo, N.Y.
LABORATORY INVESTIGATION OF THE FATE OF DIESEL EMISSIONS IN THE ATMOSPHERE Final Report on task 1
T. M. Albrechcinski and J. G. Michalovic May 1983 59 p refs
(PB84-118496; CRC-APRAC-CAPA-13-76) Avail: NTIS HC A04/MF A01 CSCL 06F

A series of experiments was performed to compare diesel aerosol samples collected downwind of a vehicle on the highway with those collected from Calspan's 600 cu m Atmospheric Simulation Facility shortly after their introduction into the chamber. These experiments demonstrated the validity of using the chamber for the systematic study of vehicle exhaust emissions. Comparisons were made on the basis of: (1) aerosol mass loading and size distribution; (2) mutagenic activity as determined by standard Ames bioassay analysis; (3) percentage of the soluble organic fraction of the aerosols; and (4) chemical signature of the samples based on the EPA-SWRI fractionation procedure. The results of this effort provide the basis for further studies to investigate the effects of atmospheric aging on the physical, chemical, and biological characteristics of diesel exhaust emissions. Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-18773*# National Aeronautics and Space Administration, Washington, D. C.
TESTING THE AUTHENTICITY OF MOLDAVITE BY ELECTRON MICROSCOPY
H. Gerthofferova Mar. 1983 3 p Transl. into ENGLISH from Mineral. Slovaca (Czechoslovakia), no. 13, 1981 p 170 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77335; NAS 1.15:77335) Avail: NTIS HC A02/MF A01 CSCL 08G

Non-destructive testing of moldavites for authenticity by electron microscopy on the basis of morphology and structure is described. Author

N84-18774*# National Aeronautics and Space Administration, Washington, D. C.
THE MAGNETIC STATE OF THE EARTH AT EPOCH 1885.0
Adolf Schmidt and Gotha Jun. 1983 90 p Transl. into ENGLISH from Arch. der Deut. Seewarte (West Germany) 21st Ann., no. 2, 1898 p 1-75 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77342; NAS 1.15:77342) Avail: NTIS HC A05/MF A01 CSCL 08N

The fundamentals and results of a geomagnetic investigation are presented. N.W.

N84-18775# Magnetic Observatory, Hermanus (South Africa).
PAPERS PRESENTED AT THE SYMPOSIUM ON UPPER ATMOSPHERE RESEARCH IN SOUTH AFRICA
1982 123 p refs Symposium held 4 Aug. 1982
(CSIR-S-325; ISBN-0-7988-2605-3) Avail: NTIS HC A06/MF A01

Projects on upper atmosphere research are presented. Topics include: geomagetism and magnetic observatories; the magnetic observatory; magnetospheric and atmospheric physics; upper atmosphere research; modulation of cosmic rays as related to the Hermanus neutron monitor. For individual titles, see N84-18776 through N84-18780.

N84-18776# International Geophysical Year World Data Center A, Boulder, Colo.
THE CHANGING WORLD OF GEOMAGNETISM: A BRIEF HISTORY RELATING TO MAGNETIC OBSERVATORIES
K. L. Svendsen *In* Magnetic Observatory Papers Presented at the Symp. on Upper Atmosphere Res. in South Africa 15 Nov. 1982 p 9-18 (For primary document see N84-18775 09-46)
Avail: NTIS HC A06/MF A01

The developments that relate to magnetic observatories are reviewed. Use of geomagnetism in navigation and mining is recounted. Separation of internal effects of geomagnetic fields from the external was studied. Automation of the observatories with help of digital computers is outlined. The Hermanus which is one member of a family of about 200 magnetic observatories in the world is discussed. The term and history of the magnetic observatory are outlined. E.A.K.

N84-18777# Magnetic Observatory, Hermanus (South Africa).
THE PRESENT STATUS OF RESEARCH AT THE MAGNETIC OBSERVATORY
P. R. Sutcliffe *In its* Papers Presented at the Symp. on Upper Atmosphere Res. in South Africa 15 Nov. 1982 p 19-60 refs (For primary document see N84-18775 09-46)
Avail: NTIS HC A06/MF A01

Research at the Magnetic Observatory is outlined. The Earth's magnetic environment was examined. Magnetospheric substorms and geomagnetic pulsations, which have their origins far above the Earth's surface in the magnetospheric region were reviewed. Solar quiet time (Sq) variations which originate mainly in the ionosphere and the modeling of the surface geomagnetic field and magnetotelluric were studied. A general background and specific research results obtained by Magnetic Observatory are described. E.A.K.

N84-18778# Natal Univ., Durban (South Africa). Dept. of Physics.
MAGNETOSPHERIC AND ATMOSPHERIC PHYSICS AT THE UNIVERSITY OF NATAL
A. D. M. Walker *In* Magnetic Observatory Papers Presented at the Symp. on Upper Atmosphere Res. in South Africa 15 Nov. 1982 p 61-83 refs (For primary document see N84-18775 09-46)
Avail: NTIS HC A06/MF A01

The history and present work performed at a magnetic observatory are outlined. The following areas are discussed: geophysics; magnetosphere; research projects; geomagnetic pulsation; plasmasphere; and magnetic storms. E.A.K.

N84-18779# Magnetic Observatory, Hermanus (South Africa).
UPPER ATMOSPHERE RESEARCH AT RHODES UNIVERSITY SINCE 1940: A REVIEW
J. A. Gledhill *In its* Papers Presented at the Symp. on Upper Atmosphere Res. in South Africa 15 Nov. 1982 p 85-98 refs (For primary document see N84-18775 09-46)
Avail: NTIS HC A06/MF A01

The history of upper atmosphere research, since 1940, is reviewed. The ionospheric effects of a total solar eclipse were studied. The development of the observation and recording instruments from manual to automated computerized equipment is outlined. A mathematical model of ionospheric changes and a miniaturized ionosonde were developed. E.A.K.

N84-18780# Potchefstroom Univ. for Christian Higher Education (South Africa). Dept. of Physics.
MODULATION OF COSMIC RAYS WITH PARTICULAR REFERENCE TO THE HERMANUS NEUTRON MONITOR
P. H. Stoker *In* Magnetic Observatory Papers Presented at the Symp. on Upper Atmosphere Res. in South Africa 15 Nov. 1982 p 99-120 refs (For primary document see N84-18775 09-46)
Avail: NTIS HC A06/MF A01

The interaction between cosmic rays and the interplanetary magnetic field were investigated. The interplanetary magnetic field defines a region within the galactic medium just as the geomagnetic field defines a region within the interplanetary medium. Galactic cosmic rays may enter the heliospheric region and an unknown fraction of these manage to reach the Earth through the interplanetary medium. The period of increasing modulation of cosmic rays from 1976 onwards is discussed. The geomagnetic field as a spectrometer for primary cosmic rays is discussed and applied to the latitude surveys in 1975 and of 1976. Features of the coronal magnetic field, the solar wind with interplanetary magnetic field, and the transport of cosmic rays in the interplanetary magnetic field is outlined to relate cosmic ray technology at fixed ground level stations to observations made in outerspace. The recordings are explained as a cosmic ray modulation process. E.A.K.

N84-18781*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PERFORMANCE APPRAISAL OF VAS RADIOMETRY FOR GOES-4, -5 AND -6
Dennis Chesters and Wayne D. Robinson (General Software Corp., Landover, Md.) Dec. 1983 63 p refs
(NASA-TM-85125; NAS 1.15:85125) Avail: NTIS HC A04/MF A01 CSCL 04A

The first three VISSR Atmospheric Sounders (VAS) were launched on GOES-4, -5, and -6 in 1980, 1981 and 1983. Postlaunch radiometric performance is assessed for noise, biases, registration and reliability, with special attention to calibration and problems in the data processing chain. The postlaunch performance of the VAS radiometer meets its prelaunch design specifications, particularly those related to image formation and noise reduction. The best instrument is carried on GOES-5, currently operational as GOES-EAST. Single sample noise is lower than expected, especially for the small longwave and large shortwave detectors. Detector to detector offsets are correctable to within the resolution limits of the instrument. Truncation, zero point and droop errors are insignificant. Absolute calibration errors, estimated from HIRS and from radiation transfer calculations, indicate moderate, but stable biases. Relative calibration errors from scanline to scanline are noticeable, but meet sounding requirements for temporarily and spatially averaged sounding fields of view. The VAS instrument is a potentially useful radiometer for mesoscale sounding operations. Image quality is very good. Soundings derived from quality controlled data meet prelaunch requirements when calculated with noise and bias resistant algorithms. Author

N84-18782*# Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
A RENORMALIZATION GROUP MODEL FOR THE STICK-SLIP BEHAVIOR OF FAULTS
R. F. Smalley, Jr., D. L. Turcotte, and Sara A. Solla [1983] 28 p refs
(Contract NAS5-23740; Grant NAG5-319)
(NASA-CR-173362; NAS 1.26:173362; Contrib-766) Avail: NTIS HC A03/MF A01 CSCL 08G

A fault which is treated as an array of asperities with a prescribed statistical distribution of strengths is described. For a linear array the stress is transferred to a single adjacent asperity and for a two dimensional array to three ajacent asperities. It is shown that the solutions bifurcate at a critical applied stress. At stresses less than the critical stress virtually no asperities fail on a large scale and the fault is locked. At the critical stress the solution bifurcates and asperity failure cascades away from the nucleus of failure. It is found that the stick slip behavior of most faults can be attributed to the distribution of asperities on the fault. The observation of stick slip behavior on faults rather than stable sliding, why the observed level of seismicity on a locked fault is very small, and why the stress on a fault is less than that predicted by a standard value of the coefficient of friction are outlined. E.A.K.

N84-18783# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROPERTIES OF AEROSOLS DURING A DUST STORM OVER THE BEIJING AREA
Mingyu Zhou, Shaohou Qu, Ximing Song, Yuying Li, Shaojin Yang, and Qinfang Qian 12 Dec. 1983 24 p Transl. into ENGLISH from Huanjing Kexue Xuebao (China), v. 1, no. 3, Sep. 1981 p 207-219
(AD-A136521; FTD-ID(RS)T-1644-83) Avail: NTIS HC A02/MF A01 CSCL 13/2

Characteristics of the aerosal in a dust storm occurring April 18-20, 1980, over Beijing areas were described. It is shown that the dust storm was formed in the Hami area of Xingjiang Province and the western part of Inner Mongolia. The strong wind area moved first toward east and then southeast when it reached the central part of the Inner Mongolia and Hebei Province. The structure of the atmospheric boundary layer was discussed for the dust storm. The aerosol concentration of this dust storm was much larger than usual by an order of magnitude. Elemental concentration in aerosol was obtained by using neutron activation analysis. It is indicated that elements Eu and Ta existed only in aerosol and in the dust storm aerosol and it is shown that elements Sc, As, Br, Sb came mainly from coal combustion. It is found that

the dust storm aerosol is made up of soil particles brought and mixed by the strong wind into the atmosphere while the particles are from areas where the strong wind is formed and passed over. GRA

N84-18784# SRI International Corp., Menlo Park, Calif.
PHENOMENOLOGY OF STRUCTURED PLASMA IN THE IONOSPHERE
James F. Vickrey, Michael D. Cousins, Roland T. Tsunoda, Nancy B. Walker, Robert C. Livingston, Charles L. Rino, and Robert M. Robinson 1 Mar. 1983 100 p
(Contract DNA001-82-C-0021; DNA Proj. I25-AAXY)
(AD-A136396; AD-E301266; DNA-TR-82-104) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report summarizes the results of the past year's efforts at SRI International to investigate experimentally and theoretically the processes that control the evolution of plasma structure in the natural and the nuclear environments. Important new results include a description of the anisotropy of large-scale and scintillation-producing plasma density irregularities at high latitudes and its convection domination, the refinement of a method to extract true irregularity drifts from spaced-receiver measurements, the first experimental observations of the formation of image striations, a model of image formation that shows the process (in agreement with observations) to be highly scale-size selective, and evidence that the previously puzzling seasonal patterns of equatorial spread-F occurrence are a result of the seasonal changes in the time of sunset in the conjugate E layers. GRA

N84-18785# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
AN INVESTIGATION OF METHODS FOR COMPUTING LONG PATH ATMOSPHERIC TRANSMITTANCE
B. R. Johnson 1 Dec. 1983 61 p
(Contract F04701-83-C-0084)
(AD-A136434; TR-0084(4753-08)-1; SD-TR-83-82) Avail: NTIS HC A04/MF A01 CSCL 04/1

The reliability of the statistical band model for long path length, low transmittance conditions is investigated by a comparing the band model with precise line by line calculations. Two test systems are utilized; a system of H2O adsorbers and a system of computer generated line parameters. It is found that the statistical band model is fairly reliable for calculating band transmittance in the range $T > 0.1$, but for transmittance less than this, it is not reliable and can be in error by several orders of magnitude. An explanation for this behavior is offered. In the second part of this investigation, a new nonstatistical method based on a simple approximation of the k-distribution function is developed. It is compared with precise line by line calculations and is found to be very reliable for all transmittance conditions. Author (GRA)

N84-18786# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
PROCEEDINGS, SEMINAR ON PROBABILISTIC METHODS IN GEOTECHNICAL ENGINEERING Final Report
M. E. Hynes-Griffin and L. L. Buege Sep. 1983 592 p Seminar held at Vicksburg, Miss., 21 Sep. 1982
(AD-A136497; WES/MP/GL-83-26) Avail: NTIS HC A25/MF A01 CSCL 08/13

Contents: Applications of Probabilistic Methods in Geotechnical Engineering; Probabilistic Seismic and Geotechnical Evaluation at a Dam Site; Probabilistic Slope Stability Methodology; Probability of Liquefaction in a 3-D Soil Deposit; Probabilistic Design of Flood Levees; Probabilistic and Statistical Methods for Determining Rock Mass Deformability Beneath Foundations: An Overview; Simple Statistical Methodology for Evaluating Rock Mechanics Exploration Data; New Developments in Statistical Techniques for Analyzing Rock Slope Stability. GRA

N84-18787# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN ESTIMATION METHOD OF VERTICAL DIFFUSION PARAMETERS IN THE MESOSCALE RANGE
L. Hsiao-en and J. Chen-hai 8 Dec. 1983 17 p Transl. into ENGLISH from Huanjing Kexue Xuebao (China), v. 1, no. 4, Dec. 1981 p 304-312
(AD-A136498; FTD-ID(RS)T-1646-83) Avail: NTIS HC A02/MF A01 CSCL 04/1

An estimation method based on the hypothesis of similarity for local turbulent characteristics in planetary boundary layers and the principle of dimensional analysis, and using the statistical form of the vertical vortex diffusion coefficient Kappa as well as Ekman spiral wind profile, at vertical dispersion pattern in the 100 km range, is derived by numerical analysis, which is applicable to both flat uniform land and complex terrain. The results so far agree fairly well with the experimental data. Author

N84-18788# Texas Univ., Austin. Inst. for Geophysics.
DEVELOPMENT OF AN ADVANCED OCEAN-BOTTOM SENSOR SYSTEM Final Technical Report, 15 Aug. 1977 - 31 Dec. 1982
G. V. Latham, D. W. McCowan, and P. L. Donoho 31 Oct. 1983 19 p
(Contract N00014-77-C-0606)
(AD-A135901; CONTRIB-574) Avail: NTIS HC A02/MF A01 CSCL 17/10

A low-cost, light-weight, long-life ocean-bottom sensor system has been developed. It incorporates three microprocessors, which control data acquisition, intermediate processing, and recording, all in digital form. The system has been used successfully in several seismic field experiments, which include detection of natural earthquakes, seismic refraction surveys and investigation of acoustic wave propagation. Author (GRA)

N84-18789# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
OHMIC HEATING OF THE POLAR f-REGION BY HF (HIGH FREQUENCY) PULSE
M. M. Shoucri, G. J. Morales, and J. E. Maggs Oct. 1983 49 p
(Contract N00014-75-C-0476)
(AD-A135946; PPG-748) Avail: NTIS HC A03/MF A01 CSCL 04/1

A study of the modifications produced by high power, high frequency (HF) waves in the F-region of a quiet (low solar cycle) polar ionosphere is presented. In the polar geometry, maximum Ohmic heating occurs producing significant changes to the zero order electron temperature and density profiles. The temporal and spatial aspects of these changes are calculated and their effects on relevant ionospheric parameters, such as the d.c. conductivity tensor, are found. An interesting finding is the generation of density cavities at the reflection point of the HF waves. A survey of the dependence of the various effects on HF pump parameters is made. Author (GRA)

N84-18790# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DIFFUSION OF PARTICULATE MATTER AND WIND SPEED PROFILE IN PLANETARY BOUNDARY LAYER
C. Pan-Chin 1 Dec. 1983 17 p Transl. into ENGLISH from Huanjing Kexue Xuebao (China), v. 1, no. 2, Jun. 1981 p 156-165
(AD-A135961; FTD-ID(RS)T-1645-83) Avail: NTIS HC A02/MF A01 CSCL 04/1

The expressions of plume axis height, reflecting coefficient and transportin factors in a Gaussian diffusion-deposition model are derived by using theoretical and experimental results in planetary boundary layer in order to obtain a new Gaussian diffusion-deposition model that could be used to describe variation of wind speed with height. The effects of wind speed profile on relative ground-level concentrations are also discussed by using the calculated results obtained. R.J.F.

N84-18791# Ben Gurion Univ. of the Negev, Sede Boqer (Israel). Inst. for Desert Research.
THE BEHAVIOR OF THE ATMOSPHERE IN THE DESERT PLANETARY BOUNDARY LAYER Final Scientific Report, 1 Jul. 1982 - 30 Jun. 1983

L. Berkofsky 30 Jun. 1983 36 p
(Grant AF-AFOSR-0285-82; AF Proj. 2310)
(AD-A135962; AFOSR-83-1119TR) Avail: NTIS HC A03/MF A01 CSCL 04/1

A general system of vertically integrated equations, including a dust concentration equation, has been derived. The boundary layer is divided into a constant flux layer, a transition layer, and an inversion layer. A novel feature of the model is the inclusion of equations to predict temperature and moisture lapse rates. The inversion height is also a function of time. A simplified version of the model has been tested with respect to its ability to predict the evolution of the inversion height and of the dust concentration. The results show very reasonable evolutions. The inversion height is lowest in the early morning, reaching a maximum in the late afternoon. The dust concentration near the ground is highest in the early morning, when the air is most stable, and lowest in mid-afternoon, when the atmosphere is least stable. These results, obtained for various particle sizes, are highly dependent upon the form of the mesoscale vertical velocity at the base of the inversion. Author (GRA)

N84-18792# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTICAL DETECTION LOSS DUE TO AIR-BORNE SALTS ON DIEGO GARCIA
R. Weber 28 Oct. 1983 44 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A136120; ETS-69; ESD-TR-83-060) Avail: NTIS HC A03/MF A01 CSCL 04/1

From 28 April to 8 May 1983, a survey team visited Diego Garcia to determine if the loss of optical transmission due to the deposition of airborne sea salts on its optical components would preclude the installation of a GEODSS site on the southern part of the island. This report describes the objectives, the motivation, the planning, the experimental procedures, the laboratory measurements, the collection and interpretation of the data, the analysis of the data, the expected detection loss, and the selection of a specific location for a GEODSS site. Then, recommendations are offered. Briefly, the results indicated that with the wind from the SE and under typical operating conditions--sky brightness greater than 19.5 magnitudes per square arcsecond and for an operational night of 12 hours--the expected detection loss due to the deposition of air-borne salts on the coverplate of a GEODSS telescope would be approximately one-tenth of a visual magnitude. The maximum loss under atypical conditions would be approximately three-tenths of a magnitude. Since it became apparent during the survey that the detection losses would not be great enough to preclude the installation of a GEODSS site on the southern part of Diego Garcia, an exact location for a site was pin-pointed by the survey team before its departure from the island. Author (GRA)

N84-18793# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
DETECTION OF BRIGHT SPOTS IN SEISMIC SIGNAL USING PATTERN RECOGNITION TECHNIQUES
K. Y. Huang and K. S. Fu Sep. 1983 263 p
(Contract N00014-79-C-0574; Grant NSF ECS-81-19886)
(AD-A136210; TR-EE83-35) Avail: NTIS HC A12/MF A01 CSCL 08/11

Bright spot is one of the pattern classes in a seismic section and the indicators of gas (hydrocarbon) accumulation. In the past, detection of bright spots depended primarily upon visual examination and the experience of a geophysicist. It is the author's contention that bright spot detection could be made more confidently by computer-aided analysis. This study concerns with two computer-aided methods. One is the decision-theorectic pattern recognition, the other is the syntactic or structural patterns recognition. Using these two methods, a seismogram is classified into two classes, i.e., bright spot and non-bright spot. GRA

N84-18794# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
SALTON SEA GEOTHERMAL FIELD, CALIFORNIA, AS A NEAR-FIELD NATURAL ANALOG OF A RADIOACTIVE WASTE REPOSITORY IN SALT
Wilfred A. Elders and Lewis H. Cohen Nov. 1983 155 p refs Prepared for Battelle Memorial Inst., Columbus, Ohio
(Contracts DE-AC06-76RL-01830; DE-AC02-83CH-10140)
(DE84-003851; BMI/ONWI-513) Avail: NTIS HC A08/MF A01

Since high concentrations of radionuclides and high temperatures are not normally encountered in salt domes or beds, finding an exact geologic analog of expected near-field conditions in a mined nuclear waste repository in salt will be difficult. The Salton Sea Geothermal Field, however, provides an opportunity to investigate the migration and retardation of naturally occurring U, Th, Ra, Cs, Sr and other elements in hot brines which have been moving through clay-rich sedimentary rocks for up to 100,000 years. The more than thirty deep wells drilled in this field to produce steam for electrical generation penetrate sedimentary rocks containing concentrated brines where temperatures reach 3650C at only 2 km depth. The brines are primarily Na, K, Ca chlorides with up to 25% of total dissolved solids; they also contain high conentrations of metals such as Fe, Mn, Li, Zn, and Pb. This report describes the geology, geophysics and geochemistry of this system as a prelude to a study of the mobility of naturally occurring radionuclides and radionuclide analogs within it. DOE

N84-18795# Geological Survey, Menlo Park, Calif.
STUDY OF SEISMIC RESPONSE AT STATIONS 6 AND 7, EL CENTRO STRONG MOTION ARRAY, IMPERIAL VALLEY, CALIFORNIA Final Report
Albert T. Chen Sep. 1983 41 p refs
(PB84-119924; USGS/GD-83/010) Avail: NTIS HC A03/MF A01 CSCL 08M

The process of assembling the shear-strength profiles is described. The profiles were derived from available data based on cone penetration and laboratory tests. A parametric study was conducted in which a number of earthquake motions as well as the strength profiles and their variations were considered as input to nonlinear seismic response computations. GRA

N84-19225# Naval Observatory, Washington, D. C.
PREDICTING VARIATIONS IN EARTH ROTATION
Alice K. Babcock and Dennis D. McCarthy *In* ESA Statist. Methods in Astron. Nov. 1983 p 167-171 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-18796# Meteorological Satellite Center, Tokyo (Japan).
METEOROLOGICAL SATELLITE CENTER TECHNICAL NOTE, NO. 8, 1983
Sep. 1983 107 p refs In JAPANESE; ENGLISH summaries
(ISSN-0388-9653) Avail: NTIS HC A06/MF A01

Cloud top heights, moisture and temperature fields, sea ice analysis, infrared brightness images, signal fading, solar eclipse, and satellite wind estimation are discussed. For individual titles, see N84-18797 through N84-18804.

N84-18797# Meteorological Satellite Center, Tokyo (Japan).
COMPARISON OF THE CLOUD TOP HEIGHTS EVALUATED FROM GMS INFRARED IMAGE WITH THE HEIGHTS REPORTED BY AIR-LINE PILOTS, PART 2
Souichi Nirei *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 1-9 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

In order to examine the accuracy of cloud top heights derived from GMS infrared images, the cloud top heights (CTH) are compared with those reported by air-line pilots during the period from May through September 1982. Two kinds of the CTH estimation methods, the mode temperature method and the minimum temperature method, which are used routinely in MSC

(Meteorological Satellite Center) and based on the histogram analysis technique, were used. Two temperatures corresponding to the two methods were derived in each case. The derived temperatures are converted to geo-potential heights by comparison with climatological vertical temperature profile data, named GMSSA (GMS Standard Atmosphere). The results show that CTH by minimum temperature methods are estimated more closely to those reported by pilots, and the deviations range from -10.6% to +1.3% as compared with CTH reported by pilots. Author

N84-18798# Meteorological Satellite Center, Tokyo (Japan).
A COMPARISON OF MOISTURE AND TEMPERATURE FIELDS DERIVED FROM METEOROLOGICAL SATELLITE VERTICAL SOUNDING (NOAA-TOVS) DATA WITH RAWINSONDE DATA, PART 2
Masakatsu Kato *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 11-40 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

A comparison of moisture and temperature fields near sea surface level derived from TIROS-N (NOAA-7) Operational Vertical Sounder (TOVS) radiance data with those from ship and bouy-robot reports (the conventional data) is performed. To examine the seasonal dependence of the accuracy of remotely sensed data, the comparison was made in 3 cases of 5 consecutive days in 3 seasons; summer (Jul. 5-9 '82). autumn (Sep. 16-20 '82) and winter (Jan. 1-5 '82). TOVS and observed data are objectively analyzed by means of correction method on the polar stereographic projection maps (grid size is 76.2 km at 60 N). Using the grid point values the difference of both data and RMS (root mean square difference of temperature or moisture) are calculated. According to these results, the mean difference of absolute values (TOVS-the observed) of surface level mixing ratio is about 2g/kg, which corresponds to the relative error of about 10-20% and RMS is around 2g/kg. In temperature fields, the mean difference of absolute values is about 2 C and RMS nearly equals 2 C-3 C. Author

N84-18799# Meteorological Satellite Center, Tokyo (Japan).
ANALYSIS OF SEA ICE IN THE SEA OF OKHOTSK USING LANDSAT-MSS DATA (COMPARISON WITH GMS DATA) c43
Takaaki Kimura *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 41-59 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

The spatial resolution of LANDSAT-MSS is about thirty times finer than that of GMS VISSR (visible) at the middle of the sea of Okhotsk. Therefore it is possible to survey the condition of sea ice there in greater detail using that observation. Seasonal variation of sea ice as seen by LANDSAT-MSS in the sea of Okhotsk and in the Bay of Terpeniya is shown in this report. It is confirmed that the drifting speed of pack-ice is related to its size. The relation between the mode and standard deviation of the brightness level frequency distribution from LANDSAT-MSS data is examined for various types of sea ice area and a comparison is made with those from GMS VISSR (visible) observation. In this research the data from the "band 7" of LANDSAT-MSS are used mainly, as the band is considered the most suitable to the observation of sea ice condition. Author

N84-18800# Meteorological Satellite Center, Tokyo (Japan).
PARTIAL LEVEL DOWN IN BRIGHTNESS OF GEOSTATIONARY METEOROLOGICAL SATELLITE (GMS) INFRARED (IR) IMAGES CAUSED BY THE MOON c43
Gunji Hirooka *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 61-66 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

The phenomena of partial level down in GMS VISSR IR brightness occurred when VISSR happened to view the Moon during the IR channel DC restoration, and were examined using the VISSR image data of 1979. It becomes clear from the study that the phenomena may occur semimonthly with 5 days duration each and the affected pictures sum up to about 80 a year. The level down magnitude depends upon both the Moon's phase (the Moon's age) and the Moon's east-westward location in the DC restoration domain viewed from VISSR. Therefore, particularly large level downs occur in cases where both conditions coincide with each other, however, they are only a few times a year. The occurring time of day, the position of VISSR scan lines and the magnitude are rather at random owing to the orbital motions of the Moon and the spacecraft. Author

N84-18801# Meteorological Satellite Center, Tokyo (Japan).
RAPID FADING OF THE SIGNAL LEVEL ON 2 GHz MICROWAVE COMMUNICATION LINK BETWEEN CDAS AND MSC c32
Hiroaki Ohta *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 67-78 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

Rapid fading of the received signal level occurred occasionally on 2 GHz microwave communication link between the Command and Data Aquisition Station (CDAS) and Meteorological Satellite Center (MSC) of the GMS system. This microwave link is used to make communications with the spacecraft and carries important signals, such as VISSR signal, command and telemetry signals, etc., from and to the satellite. When a fading phenomenon occurs, received signal fluctuates irregularly, there are some cases that its level goes down instantaneously by 20 to 30 dB at the maximum and the communication would be interrupted to some extent. A fading regime continues for a few to several hours. Fading amplitude at the CDAS receiver in general smaller than that at the MSC receiver. Autographic records of rapidly fluctuating signal level are shown for a few outstanding fading regimes. Some statistics of the fading occurence are shown for 4 years, 1979-1983. Rapid fading occurred mostly during April to July (spring to early summer) and from midnight to early morning. Author

N84-18802# Meteorological Satellite Center, Tokyo (Japan).
VISSR OBSERVATION OF THE SOLAR ECLIPSE IN RAPID-INTERVAL LIMITED SCAN MODE c92
Toshiaki Iwabuchi, Takeji Hoshino, Shuichi Katsuki, and Hiroshi Fujimura *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 79-84 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

A total eclipse of the Sun occurred around Java on June 11, 1983. During this solar eclipse, rapid-interval limited scan special observation was made every six minutes from 0420Z and a total of 10 images was obtained. As a result of the observation, a dark spot, which is the shadow of the Moon projected on the Earth surface, is seen in every visible picture and the spot is found to move from west to east. The dark spot can be recognized more clearly using the enhanced visible pictures. Author

N84-18803# Meteorological Satellite Center, Tokyo (Japan).
A HISTORY OF THE SATELLITE WIND ESTIMATION AT MSC AND THE PRESENT ACCURACY OF SATELLITE WINDS
Jousuke Ichizawa *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 85-100 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

Major modifications and improvements included changing the height assignment procedure, adopting an automatic target cloud selection method in low level cloud tracking procedure, and expanding the matching template size in automatic cloud tracking procedure. N.W.

N84-18804# Meteorological Satellite Center, Tokyo (Japan).
ON THE INFRA-RED BRIGHTNESS LEVEL INCREASE CAUSED BY THE SUN LIGHT DURING THE ECLIPSE PERIOD c74
Syuichi Katsuki *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 101-107 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

A ghost image of the Sun was noticed in the GMS-2 visible

imagery taken at 1600 GMT, 13th April 1982, in the last stage of the eclipse of the Sun at the satellite. An increase of infra-red radiance level of space was also found as an east-west band near the northern Earth edge in the previous observation, made at 1200 GMT of the same day. To investigate the cause of these phenomena, nine infra-red observations were examined from three other eclipse periods of the GMS-2. To make easier the identification of increased level band, specially enhanced (the coldest regions enhanced) pictures were provided. The degree of level increase was 3 to 8 levels (full range, 256 levels) and the width of increased level band was about 60 scan lines. To make clear possible relation of the sun light to these phenomena, a comparison was made between the position in the imagery and the width of the observed level increase and the calculated Sun's position and effective width in the imagery. These two observed and calculated factors agreed well. This phenomenon was not found in GMS imageries. Author

N84-18805*# City Coll. of the City Univ. of New York.
THEORY AND MODELING OF ATMOSPHERIC TURBULENCE, PART 1 Final Contractor Report, 1 Sep. 1981 - 31 Aug. 1982
Feb. 1984 164 p refs
(Contract NAS8-34622)
(NASA-CR-3787; NAS 1.26:3787) Avail: NTIS HC A08/MF A01 CSCL 04B

The cascade transfer which is the only function to describe the mode coupling as the result of the nonlinear hydrodynamic state of turbulence is discussed. A kinetic theory combined with a scaling procedure was developed. The transfer function governs the non-linear mode coupling in strong turbulence. The master equation is consistent with the hydrodynamical system that describes the microdynamic state of turbulence and has the advantages to be homogeneous and have fewer nonlinear terms. The modes are scaled into groups to decipher the governing transport processes and statistical characteristics. An equation of vorticity transport describes the microdynamic state of two dimensional, isotropic and homogeneous, geostrophic turbulence. The equation of evolution of the macrovorticity is derived from group scaling in the form of the Fokker-Planck equation with memory. The microdynamic state of turbulence is transformed into the Liouville equation to derive the kinetic equation of the singlet distribution in turbulence. The collision integral contains a memory, which is analyzed with pair collision and the multiple collision. Two other kinetic equations are developed in parallel for the propagator and the transition probability for the interaction among the groups. E.A.K.

N84-18806*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TABULATIONS OF AMBIENT OZONE DATA OBTAINED BY GASP (GLOBAL AIR SAMPLING PROGRAM) AIRLINERS, MARCH 1975 TO JULY 1979
William H. Jasperson (Control Data Corp., Minneapolis) and James D. Holdeman Jan. 1984 141 p refs
(Contract DOT-FA78WAI-893)
(NASA-TM-82742; E-1055; NAS 1.15:82742) Avail: NTIS HC A07/MF A01 CSCL 04B

Tabulations are given of GASP ambient ozone mean, standard deviation, median, 84th percentile, and 98th percentile values, by month, flight level, and geographical region. These data are tabulated to conform to the temporal and spatial resolution required by FAA Advisory Circular 120-38 (monthly by 2000 ft in altitude by 5 deg in latitude) for climatological data used to show compliance with cabin ozone regulations. In addition seasonal x 10 deg latitude tabulations are included which are directly comparable to and supersede the interim GASP ambient ozone tabulations given in appendix B of FAA-EE-80-43 (NASA TM-81528). Selected probability variations are highlighted to illustrate the spatial and temporal variability of ambient ozone and to compare results from the coarse and fine grid analyses. Author

N84-18807# Naval Postgraduate School, Monterey, Calif.
NUMERICAL SIMULATION OF THE FORCING OF MONSOON SURGES BY MID-LATITUDE BAROCLINIC WAVES M.S. Thesis
B. J. Baker Sep. 1983 110 p
(AD-A136274) Avail: NTIS HC A06/MF A01 CSCL 04/2

A global, six-level, primitive equation model was numerically integrated to examine the interaction of a mid-latitude baroclinic wave with several different mountain-valley configurations. The purpose was to determine the contribution of a well-developed baroclinic wave to the initiation of a monsoon surge. It was found that these waves can initiate a surge. Such surges are weak and limited in extent but they do exhibit the characteristics of observed monsoon surges. The latitudinal location of the east-west mountain range has a large impact on the strength of the disturbance and thus on the initiation of the surge. However, the size of the valley is not an important consideration. The surge is strongest at the lowest levels and dissipates rapidly with height. Overall results indicate surge forcing by the baroclinic wave is possible but other forcing mechanisms are necessary in order to simulate the stronger, more extensive surges observed during the winter monsoon. Author (GRA)

N84-18808# Calspan Advanced Technology Center, Buffalo, N.Y. Applied Technology Group.
AN EVALUATION OF MARINE FOG FORECAST CONCEPTS AND A PRELIMINARY DESIGN FOR A MARINE OBSCURATION FORECAST SYSTEM Final Report, 15 May 1981 - 15 May 1983
E. J. Mack, C. W. Rogers, and B. J. Wattle Jun. 1983 258 p
(Contract N00019-81-C-0102)
(AD-A136379; CALSPAN-6866-M-1) Avail: NTIS HC A12/MF A01 CSCL 04/2

Calspan's studies produced phenomenological descriptions of at least five new fog types, provided realistic verification on which to base new numerical modeling techniques, and developed synoptic and statistical relationships which could be used in operational forecasting. Under the current contract, Calspan conducted an objective evaluation of these predictive approaches, along with a select group of numerical models, by testing against data sets derived from at-sea observational studies. The results of this evaluation demonstrated that, with high-quality data, certain models can provide operationally useful forecasts for marine obscuration. It is also concluded that new knowledge of the physics of marine fog occurrence can help optimize the application of various forecast techniques and also serve as a back-up forecast tool. As a chief objective of this investigation, we outlined a preliminary version of an obscuration forecast system which, when fully developed, would incorporate this new knowledge and delineate the application of specific numeric and/or synoptic and statistical approaches; i.e., the system would specify a forecast tool tailored to the attendant meteorological scenario and functional within operational constraints. This report summarizes the research effort and results which led to the conceptual design of this forecast system. GRA

N84-18809# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WAVE CHARACTERISTICS OF TEMPERATURE INVERSION PROCESS OF NIGHTTIME RADIATION
Mingyu Zhou and Yi Zhang 9 Dec. 1983 11 p Transl. into ENGLISH from Kexue Tongbao (China), 1982 p 156-159
(AD-A136499; FTD-ID(RS)T-1638-83) Avail: NTIS HC A02/MF A01 CSCL 04/2

At nighttime, a stable atmospheric boundary layer is difficult to maintain, since the meteorological elements vary with time. The study of nighttime characteristics of the atmospheric boundary layer is important, especially the characteristics and variation rule of the temperature inversion process of radiation regarding the fundamental theoretical studies and practical problems, such as transport and diffusion of atmospheric contaminants. Author

N84-18810# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRUCTURAL ANALYSIS OF AIR OUTFLOW FROM LOW

LAYERS OF INTENSE THUNDERCLOUD
Cuiquan Zhu, Zhuojia Ye, Xingsheng Li, and Mingyu Zhou 9 Dec. 1983 12 p Transl. into ENGLISH from Kexue Tongbao (China), 1981 p 1504-1507
(AD-A136500; FTD-ID(RS)T-1639-83) Avail: NTIS HC A02/MF A01 CSCL 04/2

Data obtained from a 325 meter meteorological tower and data from a rain measurement radar as well as conventional meteorological were utilized in analyzing characteristics of low layer density flow of a thundercloud with a passage of a secondary cold front in summer in Beijing. With passage of the thundercloud, several turbulences appeared in the density flow; during turbulence, the momentum and heat transports were greater by two to three magnitudes than during the time without turbulence. Author

N84-18811# Federal Aviation Administration, Washington, D.C. Office of Aviation Policy and Plans.
ESTABLISHMENT AND DISCONTINUANCE CRITERIA FOR AUTOMATED WEATHER OBSERVING SYSTEMS (AWOS) Final Report
Ward L. Keech May 1983 168 p
(AD-A135674; FAA-APO-83-6) Avail: NTIS HC A08/MF A01 CSCL 04/2

This report develops establishment and discontinuance criteria for automated weather observing systems (AWOS) for publication in FAA Order 7031.2B, Airway Planning Standard Number One. Airway Planning Standard Number One contains the policy and summarizes the criteria used in determining eligibility of terminal locations for establishment, discontinuance and improvements of air navigation facilities and air traffic control services. The criteria developed in this report are based on rigorous life-cycle cost effectiveness and benefit/cost analyses of AWOS which measure weather and environmental parameters essential to FAA operations--wind direction and speed, temperature and dew point, altimeter setting, ceiling, visibility, precipitation and thunderstorm activity. Author (GRA)

N84-18812# Army Engineer Topographic Labs., Fort Belvoir, Va.
DIURNAL FREEZE-THAW FREQUENCIES IN THE HIGH LATITUDE: A CLIMATOLOGICAL GUIDE
Ruth L. Wexler 9 Jul. 1983 8 p Presented at the 4th Intern. Conf. on Permafrost, Fairbanks, Alaska, 9 Jul. 1983
(AD-A135869; ETL-R051) Avail: NTIS HC A02/MF A01 CSCL 04/2

This study provides relatively simple climatological models for determining the incidence of frost days (minimum daily temperature < 0 C), ice days (maximum daily temperature < 0 C) and freeze-thaw days (minimum daily temperature < 0 C), maximum daily temperature < 0 C) throughout Iceland, Greenland, Alaska, and E. Siberia. Both area and station models yield estimates of the frequency of diurnal freeze-thaw cycles per month or year. The various models demonstrate the relationships between daily freezing conditions and the different temperature regimes. The results should improve understanding of periglacial activity and provide a means of predicting possible climatic effects on the construction of buildings, roads and airport runways. Author (GRA)

N84-18813# California State Univ., Northridge.
PRELIMINARY STUDY FOR THE MODELING OF AN ARTIFICIAL ICING CLOUD Final Report, Oct. 1982 - Aug. 1983
Melvin Epstein, Siamak Moini, G. Thielman, and John Vilja Edwards AFB, Calif. Air Force Flight Test Center Aug. 1983 50 p
(Contract F04700-83-M-0054; AF Proj. 6320)
(AD-A135717; AFFTC-TIM-83-4) Avail: NTIS HC A03/MF A01 CSCL 04/1

An evaluation was made of the essential features required to generate an effective model of an artificial icing cloud. Several alternatives were considered. A turbulent mixing length/integral method approach appears to be the most promising. A preliminary version of the fluid mechanical aspects of this model was developed and found to predict overall cloud sizes comparable to those observed during flight tests. Calculations of the radial velocity distributions in the cloud suggest that radial stratification of droplets according to size may occur (large droplets near the periphery and small droplets near the center). Recommendations for future work are included. Author (GRA)

N84-18814# California State Univ., Northridge. Dept. of Mechanical and Chemical Engineering.
REVIEW AND ASSESSMENT OF USAF AND US ARMY (HISS) ARTIFICIAL ICING CLOUD STUDIES Final Report
H. C. Ji, S. H. Schwartz, M. R. Mirkhani, and S. Shapouri Edwards AFB, Calif. AFFTC Mar. 1983 65 p
(Contract F04700-83-M-0052; AF Proj. 6320)
(AD-A135720; AFFTC-TIM-83-2) Avail: NTIS HC A04/MF A01 CSCL 04/1

Artificial clouds were generated by an airplane or a helicopter spraying water through a bank of nozzles towed directly behind the aircraft. A trailing test aircraft was flown into the spray cloud; icing was induced on various surfaces of the test aircraft by exposing selected surfaces. In the flight tests conducted in the late 1970's, it was found that the droplets from the artificial cloud were too large, and the clouds were too small in size. In order to reduce the droplet size extensive work was performed in the NASA Lewis icing wind tunnel to select a more appropriate nozzle to achieve smaller droplet sizes, and to evaluate the effects of nozzle orientation and various flow parameters on the nature of artificially generated clouds. A design clinic team of graduate students has undertaken a study of the USAF inflight and wind tunnel test programs. The purpose of this study was to review the accumulated data and the experimental methods involved. An attempt was made to evaluate the quality, validity, and the direction of the work performed thus far, and to suggest ways to improve the experimental procedure and possibly present fresh ways to view the problem. GRA

N84-18815# Naval Research Lab., Washington, D.C. Atmospheric Physics Branch.
COMPUTER-MODEL RESULTS FOR THE BEACH-ESCARPMENT-INDUCED DISTORTION OF ONSHORE WIND FLOW AT THE NORTHWEST POINT OF SAN NICOLAS ISLAND, CALIFORNIA Final Report
John L. Walmsley (Atmospheric Environment Service, Downsview, Ontario) and Theodore V. Blanc 28 Nov. 1983 22 p
(RR0220242)
(AD-A135952; NRL-8746) Avail: NTIS HC A02/MF A01 CSCL 04/2

A computer model developed by the Atmospheric Environment Service of Canada concluded that the beach escarpment underlying the Naval Research Laboratory's micrometeorological tower facility at San Nicolas Island, California, induced wind-speed amplifications ranging from 1.00 to 1.25 and wind-direction perturbations ranging from -5 deg to +5 deg, depending upon the altitude and wind direction, for measurements made from the NRL tower. The altitudes considered ranged from 5 to 35 m above the beach for onshore winds ranging over a 180 deg arc centered about the prevailing northwest wind direction. The model calculations were based upon a high-resolution aerial survey of the island beach escarpment. The model assumes that the tide height is at mean level, the horizontal length scale is 50 m, the roughness length of both the sea and island is 0.01 m, and the atmosphere is neutrally stable. The model results are presented in graphic form, to illustrate a typical example, and in tabular form as a function of altitude and wind direction, to facilitate the use of the results as a correction algorithm for future air-sea interaction experiments at the coastal facility. Author (GRA)

N84-18816# Naval Oceanography Command Detachment, Asheville, N.C.
CLIMATIC PUBLICATIONS
Nov. 1983 13 p
(AD-A136021) Avail: NTIS HC A02/MF A01 CSCL 04/2

These summaries constitute a series of compilations which are world-wide in scope. It consists of climatological summaries for selected airfields and for the climatic areas in which they are located. The series includes data for approximately 4,000 stations

and consist of 12 volumes. Copies of these volumes are available from the Defense Technical Information Center (DTIC) or the National Technical Information Service (NTIS). The pages are generally self-explanatory with an introduction in each volume. In this summary series, the period of record varies considerably for any given station between particular elements summarized. For example, the period of record for temperature may not be the same as that for cloud cover. This fact renders the normal use of numbers in the columns under the summaries meaningless. Hence, a letter is utilized under the World-wide Airfield Summary Column in an attempt to provide the specific volume of the series in which a station is located. GRA

N84-18817# Science Applications, Inc., Monterey, Calif.
TROPICAL CYCLONE WIND PROBABILITY FORECASTING FOR THE SOUTHERN HEMISPHERE (WINDPSH) Final Report
J. D. Jarrell Oct. 1983 23 p
(Contract N00228-81-C-H361)
(AD-A136146; NEPRF-CR-83-07) Avail: NTIS HC A02/MF A01 CSCL 04/2

The development of a model to estimate 30 and 50 kt wind probabilities from Southern Hemisphere tropical cyclone forecasts is described. The model is based on position forecast errors, which are used to determine the probability of a tropical cyclone occupying a particular geographical position, and on wind profile errors. Wind profile errors consist of errors in the forecast maximum wind and errors in the forecast radius of 30 kt and 50 kt winds. The profile errors are used to estimate the probability of 30 and 50 kt winds occurring at a point, given that the tropical cyclone occupies a particular position. These position and wind probability elements are combined by using an assumption of independence which was supported by correlation coefficients in an earlier work. The model, which includes features of earlier strike and wind probability models, is tested on independent data. Test results show good agreement between forecast probability and the frequency of 30 and 50 kt winds. Author (GRA)

N84-18818# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
CURRENT PROCEDURES FOR FORECASTING AVIATION ICING: A REVIEW
W. B. Tucker, III Aug. 1983 36 p
(DA Proj. 4A1-61102-AT-24)
(AD-A136152; CRREL-SR-83-24) Avail: NTIS HC A03/MF A01 CSCL 04/2

The responsibilities for aircraft icing forecasts in the U.S. lie with the National Weather Service (NWS) for civilian operations and the U.S. Air Force Air Weather Service (AWS) and Naval Weather Service for military operations. Forecasting technology is based upon empirical rules and techniques that were developed in the 1950s. The AWS is the only forecasting agency which issues explicit numerical icing products to aid the forecaster. These products are also based upon the application of techniques developed long ago. The NWS has no rigorous guidelines for developing icing forecasts, thus individual forecasters adopt their own preferred methods. The tendency is generally to 'over-forecast', that is, to forecast too large an area of icing for too long a time. A major shortcoming in the ability to produce more accurate forecasts is that atmospheric parameters critical to icing are not routinely observed. Author (GRA)

N84-18819# National Environmental Satellite Center, Washington, D. C.
SPATIAL AND TEMPORAL DISTRIBUTION OF NORTHERN HEMISPHERE SNOW COVER
Burt J. Morse and Chester F. Ropelewski (National Weather Service) Oct. 1983 38 p refs
(PB84-118348; NOAA/TR-NESDIS-6; NOAA-83110205) Avail: NTIS HC A03/MF A01 CSCL 04B

Data, and information service since 1966 was analyzed using asymptotic singular decomposition. The results are shown on charts covering the months of November through April and the winter season. It is suggested that anomalies in snow cover over northwestern North America, the Baltic area, the Caspian Sea and Caucasus, the Tibetan Plateau, and Mongolia and Korea may occur synchronously. Charts of Northern Hemisphere snow cover frequencies and snow transition zones are included. GRA

N84-18820# National Center for Atmospheric Research, Boulder, Colo. Large-scale Dynamics Sect.
GUIDE TO TRANSFORM SOFTWARE FOR NONLINEAR NORMAL-MODE INITIALIZATION OF THE NCAR COMMUNITY FORECAST MODEL
Ronald Errico and James Vickroy Sep. 1983 96 p refs
(Grant NSF 82-17015)
(PB84-119130; NCAR-TN-217+1A) Avail: NTIS HC A05/MF A01 CSCL 04B

Descriptions of both algorithms and software that may be used to: (1) determine coefficients (i.e., amplitudes) of the normal modes of this model, given data; (2) determine data, or modifications to data, given corresponding coefficients; and (3) initialize data to remove high-frequency gravitational oscillations in a forecast are presented. Only Machenhauer's initialization scheme is described, but the software may be easily modified to execute other procedures. Also, only the actual transformation and initialization procedures are described. GRA

N84-18821# National Weather Service, Fort Worth, Tex. Southern Region.
EVALUATION OF POINT PRECIPITATION PROBABILITY FORECASTS USING RADAR ESTIMATES OF RAINFALL AREAL COVERAGE
Pamela S. Naber and Daniel L. Smith Nov. 1983 22 p refs
(PB84-121060; NOAA-TM-NWS-SR-108; NOAA-83111801) Avail: NTIS HC A02/MF A01 CSCL 04B

The relationships between first period probability of precipitation forecasts and radar estimates of areal coverage of rainfall in Southern Alabama and Northwest Florida are investigated. Forecast and observed data from the summer were analyzed and results are compared with similar analyses. GRA

N84-18822# National Weather Service, Fort Worth, Tex. Forecast Office.
REVIEW OF THE USE OF THE THERMODYNAMIC DIAGRAM AND ITS FUNCTIONS (WITH THE APPLICATION TOWARDS AFOS)
Robert O. Reed and Gary K. Grice Nov. 1983 39 p refs
(PB84-120815; NOAA-TM-NWS-SR-109; NOAA-83111802) Avail: NTIS HC A03/MF A01 CSCL 04B

This review combines information from several sources and is intended as a ready reference to the operational meteorologist. Much of the material was obtained from Air Weather Service manuals although other references also provided important contributions. Much information was lifted verbatim. A list of sources is included should more detailed information be required. This paper is divided into four sections: (1) Description of the thermodynamic diagram, (2) Meteorological quantities which can be calculated from the thermodynamic diagram, (3) Determination of stability, and (4) Raob analysis and the AFOS ANALYZ program. GRA

N84-18823# Miami Univ., Fla. School of Marine and Atmospheric Science.
SUBSYNOPTIC VARIATIONS IN SEASAT WINDS
Mariano A. Estoque and J. Fernandez-Partagas Sep. 1983 45 p refs
(Contract NA79SA-C-00737)
(PB84-131697; UM-RSMAS-83016; NOAA-83121201) Avail: NTIS HC A03/MF A01 CSCL 04B

The objectives of the present study are the following: To determine the magnitudes of subsynoptic variations of high resolution SEASAT wind observations over two tropical regions (Caribbean Sea and Gulf of Mexico); to determine whether the averaging of high-resolution SEASAT observations is necessary prior to their use in synoptic analyses. GRA

N84-18824# Miami Univ., Fla. School of Marine and Atmospheric Science.
ANALYSIS OF SEASAT WIND OBSERVATIONS IN THE GULF OF MEXICO AND THE CARIBBEAN SEA
J. Fernandez-Partagas and Mariano A. Estoque Sep. 1983 78 p
(Grant NA79SA-C-00737)
(PB84-131309; UM-RSMAS-83015; NOAA-83121202) Avail: NTIS HC A05/MF A01 CSCL 04B

In the summer of 1978 an oceanographic satellite (SEASAT) was launched for the purpose of measuring various sea surface variables. One of these variables is the radar backscatter from the sea surface roughness. With the aid of an algorithm one can use the backscatter to solve for the surface wind vector. Unfortunately, the algorithm gives a set of up to four wind solutions corresponding to each geographical point. One of the solutions represents the true wind while the others are fictitious winds or aliases. The customary procedure for selecting the true wind solution is by comparing the set of multiple wind solutions with independent wind observations in the vicinity. The object of the present investigation is to test the feasibility of the wind analysis procedure. GRA

N84-18825# National Academy of Sciences - National Research Council, Washington, D. C.
EL NINO AND THE SOUTHERN OSCILLATION: A SCIENTIFIC PLAN Final Report
Sep. 1983 85 p refs
(Grant NA79RA-C-00104)
(PB84-129733) Avail: NTIS HC A05/MF A01 CSCL 04B

This report outlines a program of observations and research to advance our understanding of the most powerful family of atmospheric and oceanic variations contributing to climatic fluctuations on time scales of months, seasons, or several years--those associated with the El Nino phenomenon and the Southern Oscillation (ENSO). The scientific plan presented in this report attempts to present the scientific rationale and objectives of an ENSO-directed program and to sketch the broad outline of observational and research programs that could address these objectives. GRA

N84-18826# National Weather Service, Garden City, N.Y.
DECODER FOR MANUALLY DIGITIZED RADAR OBSERVATIONS
M. R. Peroutka Jun. 1983 13 p
(PB84-127539; NOAA-NWS-ERCP-13; NOAA-83113002) Avail: NTIS HC A02/MF A01 CSCL 04B

Subroutines which can convert coded messages into arrays of files which could then be easily accessed by other routines were written. The decoder fills a gap in the collection. The routines were developed as part of a larger project which will eventually convert radar observations to rainfall amounts. Hourly radar reports transmitted through the AFOS system contain a manually digitized section. To maintain a structured approach, the decoding has been divided among six FORTRAN subroutines. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-18827# Naval Postgraduate School, Monterey, Calif.
A MODEL FOR TIDAL CIRCULATION ADAPTED TO MONTEREY BAY, CALIFORNIA M.S. Thesis
C. W. Schomaker Sep. 1983 100 p
(AD-A135077) Avail: NTIS HC A05/MF A01 CSCL 08/3

An implicit numerical model for two-dimensional hydrodynamic flow in coastal seas by Leendertse (1967), as modified by Hart (1976), was applied to Monterey Bay. The model was tested against available water-level and current observations. The responses of Monterey Bay to tidal forcing and steady-state winds were simulated. Under tidal forcing it was found to provide reasonable estimates of sea-surface elevations. Currents were not well predicted, indicating that other mechanisms such as wind, density stratification, and oceanic currents generally dominate the forcing of the circulation in Monterey Bay. The model in its present form was found to be potentially suitable for providing real-time tide correctors during a hydrographic survey, achieving an RMS error of 4.5 cm in predicting sea-surface elevations. Author (GRA)

N84-18828# Pacific Missile Test Center, Point Mugu, Calif.
TIDAL AND LUNAR DATA FOR POINT MUGU, SAN NICOLAS ISLAND AND THE BARKING SANDS AREA, 1984
Rich W. Dixon 30 Dec. 1983 66 p
(AD-A135243; PMTC-TP-000014) Avail: NTIS HC A04/MF A01 CSCL 08/3

Basic lunar and tidal data for Point Mugu, San Nicolas Island, and the Barking Sands area during 1984 are provided. The data presented are (1) tidal data, (2) times of moonrise and moonset, and (3) times of lunar phases. Author (GRA)

N84-18257# Joint Publications Research Service, Arlington, Va.
NELEPO DESCRIBES INTERCOSMOS-BLACK SEA EXPERIMENT
B. Nelepo *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 70-73 Transl. into ENGLISH from Pravda (Moscow), 9 Oct. 1983 p 3 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-18829*# National Aeronautics and Space Administration, Washington, D. C.
NASA SPACE BIOLOGY PROGRAM. EIGHTH ANNUAL SYMPOSIUM'S PROGRAM AND ABSTRACTS
Thora W. Halstead, ed. Feb. 1984 121 p refs Symp. held in Arlington, Va., 12-14 Oct. 1983
(NASA-CP-2299; EBT-3; NAS 1.55:2299) Avail: NTIS HC A06/MF A01 CSCL 06C

The activities included five half days of presentations by space biology principal investigators, an evening of poster session presentations by research associates, and an afternoon session devoted to the Flight Experiments Program. Areas of discussion included the following: gravity receptor mechanisms; physiological effects of gravity, structural mass; fluid dynamics and metabolism; mechanisms of plant response; and the role of gravity in development. For individual titles, see N84-18830 through N84-18884.

N84-18830*# Cornell Univ., Ithaca, N.Y. Inst. for Plant Research.
AMYLOPLAST MOVEMENT IN LIVING STATOCYTES Abstract Only
A. Carl Leopold and Fred Sack *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 1 (For primary document see N84-18829 09-51)
(Grant NAGw-3)
Avail: NTIS HC A06/MF A01 CSCL 06C

Much evidence implicates amyloplast movement in plant graviperception. How this signal is transduced into a differential growth response is not known. Studies using fixed tissue are useful for deriving mean sedimentation rates, but cannot yield data on: the movement of individual amyloplasts, the role of cytoplasmic streaming, and the initial dynamic events occurring during the presentation time. These limitations were overcome by examining living tissue sections with a horizontally mounted microscope connected to a video camera and recorder. The kinetics of the early response to reorientation are consistent with the hypothesis that amyloplasts act by contact with a sensitive surface near the lower wall and indicate that cytoplasmic streaming provides an important vector in amyloplast redistribution in response to gravity. Author

N84-18831*# Texas Univ., Austin. Dept. of Botany.
INHIBITION OF GRAVITROPISM IN OAT COLEOPTILES BY CALCIUM CHELATION Abstract only
Stanley J. Roux *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 2-3 (For primary document see N84-18829 09-51)
(Grant NsG-7480)
Avail: NTIS HC A06/MF A01 CSCL 06C

Some cellular event necessary for gravitropism is inhibited by EGTA without interferring with the overall growth. Calcium relieves this inhibition and demonstrates both that inhibition is reversible and was probably due to a reduction in the ability to free calcium required for one or more at the transduction steps of gravitropism. At the near neutral pH used, EGTA is charged and would not be expected to readily cross the membrane. One of its primary effects, then, is probably the bringing of free calcium in the apoplastic space exterior to the cell membranes. Author

N84-18832*# Michigan Univ., Ann Arbor.
PROTEIN CHANGES IN LEAF-SHEATH PULVINI OF BARLEY (HORDEUM) INDUCED BY GRAVISTIMULATION Abstract Only
Peter B. Kaufman and Il. Song *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 4-5 (For primary document see N84-18829 09-51)
(Grant NAGw-34)
Avail: NTIS HC A06/MF A01 CSCL 06C

Sodium dodecyl sulfate polyacrylamade gel electrophoresis (SDS-PAGE) pattern of salt soluble proteins elicite by gravistimulation were shown in the top and the bottom halves of the gravistimulated pulvini as follows: at least five proteins were increased in the tissues derived from the bottom halves of the pulvini in the approximate molecular weight range of 91, 57, 50, 22, 17 kilodatons. SDS densitometric scans indicated that the two of them are probably cellulase and invertase. B.G.

N84-18833*# Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
AN ATTEMPT TO LOCALIZE AND IDENTIFY THE GRAVITY SENSING MECHANISM OF PLANTS Abstract Only
Robert S. Bandurski *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 6-7 refs (For primary document see N84-18829 09-51)
(Grant NAGw-97)
Avail: NTIS HC A06/MF A01 CSCL 06C

Gravistimulation causes an asymmetric distribution of the plant growth hormone, indole-3-acetic acid (IAA). In what tissue of the plant the IAA asymmetry arises will be determined so as to better localize the gravity sensing device. Author

N84-18834*# Ohio State Univ., Columbus.
THE ROLE OF CALCIUM IN THE GRAVITROPIC RESPONSE OF ROOTS Abstract Only
Michael L. Evans *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 8-9 refs (For primary document see N84-18829 09-51)
(Grant NAGw-297)
Avail: NTIS HC A06/MF A01 CSCL 06C

Previous research has indicated that gravity-induced calcium redistribution may play an important role in the gravitropic response of shoots. Calcium was shown to move toward the upper side of gravistimulated shoots (1), and inhibitors of the calcium-activated regulator protein, calmodulin, were shown to interfere with the gravitropic response of coleoptiles (2). The potential involvement of calcium redistribution in the gravitropic response of roots by testing was examined: (1) the effect on gravitropism of calcium chelators applied to the root cap, (2) the ability of calcium gradients applied across the root cap to induce gravitropic-like curvature, and (3) the influence of gravity on the movement of Ca(45)(2+) across the root cap. Author

N84-18835*# Kenyon Coll., Gambier, Ohio.
CALCIUM ELICITED ASYMMETRIC AUXIN TRANSPORT IN GRAVITY INFLUENCED ROOT SEGMENTS Abstract Only
Kathryn L. Edwards *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 10-11 (For primary document see N84-18829 09-51)
(Grants NAGw-368; PCM-8207147)
Avail: NTIS HC A06/MF A01 CSCL 06C

Auxin is a prime candidate for regulating and modulating the differential growth response of primary corn roots to gravity. Auxin, indole-3-acetic acid (IAA), both promotes and inhibits root elongation rapidly within a narrow concentration range. Thus growth regulation would require only small changes in the short lag period for initiation of gravitropism. Since auxin is transported to/through the zone of elongation toward the meristem, it may serve as a direct communication link between the zone of elongation, site of gravitropic response, and the root cap (RC), site of gravity perception. When auxin transport is inhibited, gravitropism is also inhibited. Napthylpthalamic acid (NPA) is one such inhibitor. It inhibits gravitropism only when applied to the apical growing and dividing region of the root. Application at the basal end of the root does not influence gravitropic NPA causes upward curvature when applied to the upper surface of horizontal, two day-old, intact corn roots. This effect is countered by application of IAA to the opposite side. Author

N84-18836*# San Diego State Univ., Calif.
MECHANISM OF SHOOT GRAVITROPISM Abstract Only
David L. Rayle *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 12 (For primary document see N84-18829 09-51)
(Grant NAGw-230)
Avail: NTIS HC A06/MF A01 CSCL 06C

A better understanding of the cellular basis of plant shoot gravitropism was sought. A critical evaluation of the role of auxin gravitropism was provided. An alternative hypothesis which links Ca(42) fluxes to the asymmetric growth that leads to gravicurvature was evaluated. Author

N84-18837*# California Univ., Berkeley. Dept. of Botany.
PROTEIN AND CAROTENOID SYNTHESIS AND TURNOVER IN GRAVISTIMULATED ROOT CAPS Abstract Only
Lewis J. Feldman *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 13 (For primary document see N84-18829 09-51)
(Grant NAGw-239)
Avail: NTIS HC A06/MF A01 CSCL 06C

In certain cultivars of corn gravitropic bending occurs only after the root cap, the site of gravity perception, is exposed to light. Light appears to trigger or to remove some block in the gravity translation process. Using light sensitive cultivars of corn, it was shown that light affects various processes in the cap. The roles of these light-induced processes in gravitropic bending in roots were studied. Author

N84-18838*# Washington Univ., St. Louis, Mo.
SMALL GRAVITATIONALLY ELICITED VOLTAGE TRANSIENTS IN PEA STEMS Abstract Only
Barbara G. Pickard *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 14-15 (For primary document see N84-18829 09-51)
(Grant NAGw-420)
Avail: NTIS HC A06/MF A01 CSCL 06C

Decapitated veritcal stem segments were observed for 45 min, noting the number of transients > mu V for each 5-min interval. Results for two sets of stem segments are plotted. The average frequencies were 0.72 + or -0.05 and 0.66 + or - 0.04 per 5 min. One set of segments was swiveled gently to the horizontal position; then, recording continued for another 90 min. Transients continued in the vertical controls at a closely similar average rate 0.78 + or - 0.04 per 5 min. However, after the first 5-min interval the horizontally placed plants exhibited transients at an increased average rate of 1.08 + or - 0.04 per 5 min. The frequency of transients also increased following horizontal placement of intact shoots. However, it appears that this increase had two components: one due to gravity reception, and one due to the redistribution of indolacetic acid (IAA) believed to mediate gravitropic curvature

(or, more specifically, to the increase of IAA in the lower tissue. Author

N84-18839*# Yale Univ., New Haven, Conn. Dept. of Biology.
MECHANISMS OF GRAVIPERCEPTION AND RESPONSE IN PEA SEEDLINGS Abstract Only
Arthur W. Galston *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 16 refs (For primary document see N84-18829 09-51)
(Grant NsG-7290)
Avail: NTIS HC A06/MF A01 CSCL 06C

A new method for the mass isolation and purification of multigranular amyloplasts from the bundle sheath parenchyma of etiolated pa epicotyls was presented. These bodies, which displace within 2+3 minutes of exposure to 1 x g, are probably the gravity receptors (statoliths) in this plant. These amyloplasts were characterized as having a doublemembrane with a surface-localized ATPase, a high calcium content, and their own genomic DNA. These amyloplasts are investigated as to (a) the reasons for their especially high density, probable related to their starch content, (b) the possible identity of their DNA with the DNA of chloroplasts and unigranular amyloplasts, and (c) possible importance of their high calcium content. Author

N84-18840*# Michigan Univ., Ann Arbor.
MAMMALIAN GRAVITY RECEPTORS: STRUCTURE AND METABOLISM Abstract Only
Muriel Ross *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 17 (For primary document see N84-18829 09-51)
(Grant NsG-9047)
Avail: NTIS HC A06/MF A01 CSCL 06C

High performance liquid chromatography (HPLC) instrumentation was used for amino acid analysis of rat otoconial complexes. The amino acids of otoconial complexes pooled by origin from only 10 rats were analyzed. It is indicated that it should be possible to analyze complexes from only three rats, and perhaps fewer, which means that the method should be applicable to material from space flow rats. It is suggested that the organic otoconial phase is comparable in its complement of acidic amino acids to other calcium carbonate containing materials such as fish otoliths and certain mollusk shells. The organic material is high in acidic amino acids; and the relative proportions of aspirate, glutamate, threonine and serine appear to be similar to those found in neogastropod shells. Its significance to the evolution of biomineralization processes occurring in the animal kingdom is emphasized. E.A.K.

N84-18841*# Temple Univ., Philadelphia, Pa.
AMPLITUDE DISTRIBUTIONS OF THE SPIDER HEARTPULSE IN RESPONSE TO GRAVITATIONAL STIMULI Abstract Only
Alfred Finck *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 18-19 (For primary document see N84-18829 09-51)
(Grant NAGw-242)
Avail: NTIS HC A06/MF A01 CSCL 06C

The arachnid Nuctenea sclopetaria (Clerck) which possesses a neurogenic heart, measuring the heartbeat is under efferent control through a dorsal nerve arising from a brain center is discussed. It was shown that the heartrate of this spider is also modulated by an afferent input associated with small increments of gravity. A compressive force on the order of 40 micron is sufficient to elicit a threshold change in heart rate for a typical (100mg) spider. This obtains in a hyper-Gz field less than 1.001. The functional relationship between gravity and heartrate is logarithmic between the absolute threshold and at least 1.5 Gz. A model was proposed in which equilibrium and movement are maintained by changes in blood pressure. It is concluded that the arachnid equilibrium system is like a weight detector which employs a hydraulic compensatory mechanism. E.A.K.

N84-18842*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STRUCTURAL DEVELOPMENT AND GRAVITY Abstract Only
Emily R. Morey-Holton *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 20-21 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Changes in contical bone formation found in rats on the model and wheather they are due to hind limb unloadng or involve a stress response was studied. Variables known to effect bone histomorphometry and physiology in that model are defined. The variables studied were: (1) changes in bone formation with age in two commonly used rat strains; (2) effects of cold stress on bone formation and apposition rates relative to changes in the same parameter in rats on the model. Body mass, growth rates, and tibial radographic and histomorphometric measurements were compared in Sprague-Dawley (S/D) and Fischer 344 (F) rats aged 6 to 68 weeks. Histomorphometric measurements of rat tibia from the juvenile to the adult period were studied, and tibial growth rates relative to both age and weight were compared. The physiological effects of unweighting the hind-limbs with those of cold stress in rats studied after 1 or 3 weeks of exposure. Adrenal weights, thymus weights, and corticosteroid levels were used as indictors of environmental stress. E.A.K.

N84-18843*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BONE LOSS IN TAIL-SUSPENDED RATS IN RESTRICTED TO THE UNWEIGHTED LIMBS Abstract Only
Daniel D. Bikle, Ruth Globus, and Emily R. Morey-Holton *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 22-24 (For primary document see N84-18829 09-51)
(Grant NAGw-236)
Avail: NTIS HC A06/MF A01 CSCL 06C

Space flight which results in certain characteristic changes in the skeleton and it was hypothesized that these abnormalities are a direct result of the weightless state. To determine the role of PTH and 1,25(OH)2D in the bone changes associated with weightlessness, we studied bone metabolism under various dietary conditions using an Earth based rat model system which simulates weightlessness. In this model, rats are suspended by their tails such that their rear limbs are completely unloaded while their fore limbs are normally loaded. It is suggested that skeletal unloading induces a localized defect in the unloaded bone which results in abnormal growth and mineralization. It is concluded that skeletal unloading may make the unloaded bone more or less sensitive to a systemic factor which in turn could account for a change in bone metabolism. E.A.K

N84-18844*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATING CERTAIN ASPECTS OF HYPOGRAVITY: EFFECTS ON THE MANDIBULAR INCISORS OF SUSPENDED RATS (PULEH MODEL) Abstract Only
David J. Simmons (Washington Univ.), Frank Winter (Washington Univ.), and Emily R. Morey-Holton *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 25-26 (For primary document see N84-18829 09-51)
(Grant NAGw-301)
Avail: NTIS HC A06/MF A01 CSCL 06C

The effect of a hypogravity simulating model on the rate of mandibular incisor formation, dentinogenesis and, amelogenesis in laboratory rats was studied. The model is the partial unloading by elevating the hindquarters. In this system, rat hindquarters are elevated 30 to 40 deg from the cage floors to completely unload the hindlimbs, but the animals are free to move about using their forelimbs. This model replicates the fluid sift changes which occur during the weightlessness of spaceflight and produces an osteopenia in the weight bearing skeletons. The histogenesis and/or mineralization rates of the mandibular incisor during the first 19d of PULEH in young growing rats are recorded. E.A.K

N84-18845*# Washington Univ., St. Louis, Mo. Dept. of Surgery/Orthopedics.
THE EFFECTS OF SPACEFLIGHT ON THE MINERALIZATION OF RAT INCISOR DENTIN Abstract Only
David J. Simmons and Gary D. Rosenberg (Indiana Univ.) *In*

NASA. Washington NASA Space Biol. Program Feb. 1984 p 27 (For primary document see N84-18829 09-51)
(Grant NAGw-301)
Avail: NTIS HC A06/MF A01 CSCL 06C

Specific effects of space flight on dentin formation on the lower incisors of male rats were determined. Data were Fourier analyzed to determine the spectra of chemical growth rhythms. It was found that Calcium and P were more concentrated in the newly forming dentin of the Flight rats than in comparable regions of control tissues. There was no significant difference in the mean S-concentration between the two groups, but the pattern of S-distribution in the recently formed dentin from the Flight rats was different from that in the control group. Sulfur fluctuations in flight animals periodically peak above the irregular background fluctuations, but there are no comparable sulfur peaks across the dentin in the control. It is indicated that spaceflight has measurable effects on dentinogenesis, and may also bear on the problem of the regulatory role of proteoglycans in mineralization and the maturation of mineral and matrix moieties in skeletal tissue. E.A.K.

N84-18846*# University of the Pacific, Stockton, Calif. Dept. of Orthodontics.
INFLUENCE OF STRESS, WEIGHTLESSNESS, AND SIMULATED WEIGHTLESSNESS ON DIFFERENTIATION OF PRE-OSTEOBLASTS Abstract Only
W. Eugene Roberts *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 28 (For primary document see N84-18829 09-51)
(Grant NAGw-356)
Avail: NTIS HC A06/MF A01 CSCL 06C

The effects of 18.5 days of weightlessness aboard a satellite, stress of restricted feeding, stress of noise and vibration to simulate space flight and 21 days of head down suspension via the Morey-Holton model for simulated weightlessness was studied. Nuclear size of fibroblastlike cells in PDL on the anterior surface of maxillary first molars was classified as: (1) A-cells, self perpetuating precursors with a nuclear volume < 80 micron B-cells, nonosteogenic fibroblasts with a nuclear volume of 80-119 micron 3, C-cells, preosteoblasts that are in G1 stage of the cell cycle with a nuclear size of 120-170 micro, and D-cells, preosteoblasts that are in G2 stage of the cell cycle with a nuclear size > 170 micro. E.A.K.

N84-18847*# Columbia Univ., New York. Dept. of Anatomy/Cell Biology.
MORPHOLOGICAL AND HISTOCHEMICAL STUDIES OF BONE AND CARTILAGE DURING PERIODS OF STIMULATED WEIGHTLESSNESS Abstract Only
Stephen B. Doty *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 29-30 refs (For primary document see N84-18829 09-51)
(Grant NAGw-238)
Avail: NTIS HC A06/MF A01 CSCL 06C

Rats which were subjected to spaceflight for 2-4 weeks showed considerable loss in ability to form new bone. Animals which are placed into nonweight bearing positions, as a model to simulate the absence of gravity here on the Earth's surface. Show a similar decline in new bone formation. It is suggested that the mechanisms underlying these changes may be the result of reduced transmission of gravitational force to the skeletal cells. E.A.K

N84-18848*# Arizona Univ., Tucson.
METABOLIC ALTERATIONS CAUSED BY SUSPENSION HYPOKINESIA IN LEG MUSCLES OF RATS Abstract Only
Marc E. Tischler *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 31-32 (For primary document see N84-18829 09-51)
(Grant NAGw-277)
Avail: NTIS HC A06/MF A01 CSCL 06C

Metabolic changes on hypokinetic rats were measured. Two groups of animals were studied: (1) weight bearing control which were tail casted but allowed to walk on all four limbs, and (2) hypokinetic with no load bearing of the hindlimbs. The control and hypokinetic rats gained weight at a steady and similar rate over 6 days. Hypokinesia for 6 days led to significantly lower relative weights of the soleus, gastrocnemius and plantaris muscles. Hypokinesia did not effect the relative mass of the anterior tibialis or extensor digitorum longus (EDL) muscles. E.A.K.

N84-18849*# Texas Univ. Health Science Center, Dallas.
BIOCHEMICAL AND HISTOCHEMICAL ADAPTATIONS OF SKELETAL MUSCLE TO RAT SUSPENSION Abstract Only
Gordon H. Templeton *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 33-34 refs (For primary document see N84-18829 09-51)
(Grant NAGw-140)
Avail: NTIS HC A06/MF A01 CSCL 06C

The influence of rat suspension on soleus disuse and atrophy was investigated to measure changes in fiber area and number and to determine if suspension elicited changes in lysosomal protease activity and rate of calcium uptake by the sarcoplasmic reticulum. The infuence of rat suspension on myosin light chain phosphorylation and succinate dehydrogenase activity are determined. E.A.K.

N84-18850*# Vanderbilt Univ., Nashville, Tenn.
PHYSIOLOGICAL CHANGES IN FAST AND SLOW MUSCLE WITH SIMULATED WEIGHTLESSNESS Abstract Only
Wolf-D. Dettbarn and Karl E. Misulis *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 35-36 (For primary document see N84-18829 09-51)
(Grant NAGw-469)
Avail: NTIS HC A06/MF A01 CSCL 06C

A rat hindlimb suspension model of simulated weightlessness was used to examine the physiological characteristics of skeletal muscle. The physiological sequelae of hindlimb suspension were compared to those of spinal cord section, denervation by sciatic nerve crush, and control. Muscle examined were the predominantly slow (Type 1) soleus (SOL) and the predominantly fast (Type 2) extensor digitorum longus (EDL). Two procedures which alter motor unit activity, hindlimb suspension and spinal cord section, produce changes in characteristics of skeletal muscles that are dependent upon fiber type. The SOL develops characteristics more representative of a fast muscle, including smaller Type 1 fiber proportion and higher AChE activity. The EDL, which is already predominantly fast, loses most of its few Type 1 fibers, thus also becoming faster. These data are in agreement with the studies in which rats experienced actual weightlessness. M.G.

N84-18851*# Arizona Univ., Tucson.
APPROPRIATENESS OF THE SMALL-CAGE-REARED RAT AS A MODEL FOR THE STUDY OF ALTERED-ACTIVITY EFFECTS Abstract Only
R. M. Enoka and D. G. Stuart *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 37-38 refs (For primary document see N84-18829 09-51)
(Grant NAGw-338)
Avail: NTIS HC A06/MF A01 CSCL 06C

Within genetically imposed limits, the fatigue-resistance capability of muscle varies according to the chronic demands of usage imposed on the muscle. Given the fiber-type distribution within a muscle, its fatigue-resistance can be utilized as an indicant of its physiological status. It is suggested that the hindlimb musculature of rats raised in cages constructed to minimum DFA specifications are physiologically inappropriate for the study of altered-activity effects. This proposition is based upon two observations from the medial gastrocnemius muscle (n = 7) of Sprague-Dawley rats (500 g, 100 d); first, a substantial disparity in the peak forces (twitch and tetanic) elicited by neural and direct-muscle stimulation, and second, a reduction in force during the fatigue test (2 min of 1 Hz trains with each train lasting 330 ms and including 13 stimuli) that was greater (79%) than theoretically expected (62%). Both of these observations are critically assessed. M.G.

N84-18852*# California Univ., Riverside. Div. of Biomedical Sciences.

HOMEOSTASIS IN PRIMATES IN HYPERACCELERATION FIELDS Abstract Only
Charles A. Fuller *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 39-40 (For primary document see N84-18829 09-51)
(Grant NAGw-309)
Avail: NTIS HC A06/MF A01 CSCL 06C

Various homeostatic responses of a nonhuman primate, the squirrel monkey (Saimiri sciureus) to acute changes in the acceleratior. environment were examined. When these animals were exposed to a hyperdynamic field the body temperature was consistentl'y depressed and the animals showed behavioral indications of increased drowsiness. Further, time of day played a significant role in influencing these responses. M.G.

N84-18853*# California Univ., Davis. Dept. of Animal Physiology.
SET-POINT CHANGES IN HIERARCHICALLY-ARRANGED THERMOGENIC SYSTEMS Abstract Only
John M. Horowitz *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 41-42 refs (For primary document see N84-18829 09-51)
(Grant NsG-2234)
Avail: NTIS HC A06/MF A01 CSCL 06C

Rats acclimated to either 23 or 5 C were concurrently exposed to cold and hypergravic fields to test the proposal that mammals have parallel controllers for thermoregulation. The two groups of rats were used to evaluate the different relative contributions of shivering and nonshivering thermogenesis to the increased oxygen consumption of the cold-exposed rats in hypergravic fields. The lower magnitude of the cold-induced oxygen consumption observed when cold-exposed rats are moved from 1 G to hypergravic fields is probably due to an inactivation of shivering rather than nonshivering thermogenesis. The observation that shivering, but not nonshivering thermogenesis, appears to be impaired by hypergravic fields is consistent with the representation of central thermoregulation by multiple controllers. M.G.

N84-18854*# California Univ., Berkeley.
GRAVITY, BODY MASS AND COMPOSITION, AND METABOLIC RATE Abstract Only
Nello Pace and Arthur H. Smith *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 43-44 (For primary document see N84-18829 09-51)
(Grant NsG-7336)
Avail: NTIS HC A06/MF A01 CSCL 06C

The scale effects of increased gravitational loading by chronic centrifugation on metabolic rate and body composition in metabolically mature mammals were investigated. Individual oxygen consumption rates in groups of 12 each, 8-month-old, hamster, rats, guinea pigs, and rabbits were measured at weekly intervals at 1.0 g, then 2.0 g for 6 weeks. Metabolic rate was increased significantly in all species, and stabilized after 2 weeks at 2.0 g. Statistical analysis of the data revealed that the larger the animal the greater was the increase in mass-specific metabolic rate, or metabolic intensity, over the 1.0 g value for the same animal, with the result that the interspecies allometric scaling relationship between metabolic rate and total body mass is different at 2.0 g compared 10 1.0 g. Analysis of covariance shows that the postioning constant at 2.0 g is increased by 17% at 2.0 g at the $P < .001$ level, and the exponent is increased by 8% at the $P = 0.008$ level. Thus, the hypothesis that augmented gravitational loading should shift the allometric relationship between metabolic rate and body size by an increase in both parameters is supported. M.G.

N84-18855*# Louisville Univ., Ky. Dept. of Physiology and Biophysics.
EXTENSIONS OF SUSPENSION SYSTEMS TO MEASURE EFFECTS OF HYPOKINESIA/HYPODYNAMIA AND ANTIORTHOSTASIS IN RATS Abstract Only
X. J. Musacchia and Joseph M. Steffen *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 45-47 (For primary document see N84-18829 09-51)
(Grant NsG-2325)
Avail: NTIS HC A06/MF A01 CSCL 06C

Suspension systems are used to simulate hypokinetic/hypodynamic (H/H) and anitorthostatic (AO) responses seen under conditions of weightlessness. Growing rats in H/H suspension with unloaded hindlimbs for one and two weeks respond with muscle atrophy and increased excretion of nitrogenous end products such as urea, NH3 and 3 methyl histidine. Since muscle is in a dynamic state of synthesis and breakdown of protein, relationships between protein, RNA and DNA contents in the four muscles which reflect weight bearing and non-weight bearing functions were assessed. Protein and RNA progressively decreased over a one and two week period of H/H suspension: soleus > gastrocnemius=plantaris > EDL. Concommitant analysis of DNA contents showed there were no changes. The interpretation was that protein synthesis was slowed during H/H. As with muscle mass, protein and RNA levels recovered rapidly after removal from H/H. The AO rats (which are also H/H) respond with diuresis, natriuresis and kaliuresis in a manner comparable to responses seen when thoracic blood vessels are volume loaded. M.G.

N84-18856*# Baylor Coll. of Medicine, Houston, Tex.
REGULATION OF HEMATOPOIESIS IN THE SUSPENDED RAT AS A MODEL FOR SPACE FLIGHT Abstract Only
C. D. R. Dunn and P. C. Johnson *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 48-49 (For primary document see N84-18829 09-51)
(Grant NAGw-308)
Avail: NTIS HC A06/MF A01 CSCL 06C

A series of studies was completed in which a variety of routine hematological and other parameters were obtained from sequential sampling of control and suspended rats. These data showed that, during suspension, the rats failed to gain weight at the same rate as the controls, ate and drank significantly less, demonstrated a transient increase in peripheral hematocrit and RBC count, a transient decrease in MCH, suppressed reticulocyte counts and a progressive decrease in MCV but no change in RBC shape. Leukocyte counts were variably decreased but no significant changes in platelet numbers were noted. Post-suspension, evidence of anemia was present from a reduced RBC count, hemoglobin, hematocrit, and MCV. A leukocytosis was also noted. Efforts directed to the collection of data aimed at understanding changes in blood volume during suspension are also discussed. As part of these studies the following parameters were investigated; RBC survival, in vitro leukocyte reactivity to PHA, bone marrow and spleen cellularity and morphology, ferrokinetics, and the hematopoietic inductive microenvironment. M.G.

N84-18857*# Utah State Univ., Logan.
GRAVITROPISM IN LEAFY DICOT STEMS Abstract Only
Frank B. Salisbury *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 50-51 (For primary document see N84-18829 09-51)
(Grant NsG-7567)
Avail: NTIS HC A06/MF A01 CSCL 06C

In an attempt to separate plant responses to mechanical stresses from responses to gravity compensation, six treatments were automated: (1) upright stationary controls; (2) horizontal clinostat; (3) intermittent clinostat (plants upright 3.3 minutes out of every 4 minutes, horizontal and rotated once in the remaining time); (4) inversion every ten minutes (plants upside down half the time); (5) inversion and immediate return to the vertical; and (6) vertical rotation. Epinasty appeared only on clinostated and on inverted plants, both subjected to gravity compensation. The mechanics of gravitropic stem bending and the effects of a unilateral application of ethephon of gravitropic bending were also investigated. M.G.

N84-18858*# Purdue Univ., Lafayette, Ind. Dept. of Horticulture.
MECHANICAL REGULATION OF PLANT GROWTH AND DEVELOPMENT Abstract Only

Cary A. Mitchell *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 52-53 (For primary document see N84-18829 09-51)
(Grant NsG-7278)
Avail: NTIS HC A06/MF A01 CSCL 06C

Soybean and eggplant grown and shaken in a greenhouse exhibited decreased internode length, internode diameter, leaf area, and fresh and dry weight of roots and shoots in much the same way as outdoor-exposed plants. Perhaps more important than decreased dimensions of plant parts resulting from periodic seismic treatment is the inhibition of photosynthetic productivity that accompanies this stress. Soybean plants briefly shaken or rubbed twice daily experienced a decrease in relative as well as absolute growth rate compared to that of undisturbed controls. Growth dynamics analysis revealed that virtually all of the decline in relative growth rate (RGR) was due to a decline in net assimilation rate (NAR), but not in leaf area ratio (LAR). Lower NAR suggests that the stress-induced decrease in dry weight gain is due to a decline in photosynthetic efficiency. Possible effects on stomatal aperture was investigated by measuring rates of whole plant transpiration as a function of seismo-stress, and a transitory decrease followed by a gradual, partial recovery was detected. M.G.

N84-18859*# Wake Forest Univ., Winston-Salem, N.C.
MEASUREMENT OF THIGMOMORPHOGENESIS AND GRAVITROPISM BY NON-INTRUSIVE COMPUTERIZED VIDEO IMAGE PROCESSING Abstract Only
Mordecai J. Jaffe *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 54-54a (For primary document see N84-18829 09-51)
(Grant NAGw-96)
Avail: NTIS HC A06/MF A01 CSCL 06C

A video image processing instrument, DARWIN (Digital Analyser of Resolvable Whole-pictures by Image Numeration), was developed. It was programmed to measure stem or root growth and bending, and coupled to a specially mounted video camera to be able to automatically generate growth and bending curves during gravitropism. The growth of the plant is recorded on a video casette recorder with a specially modified time lapse function. At the end of the experiment, DARWIN analyses the growth or movement and prints out bending and growth curves. This system was used to measure thigmomorphagenesis in light grown corn plants. If the plant is rubbed with an applied force load of 0.38 N., it grows faster than the unrubbed control, whereas 1.14 N. retards its growth. Image analysis shows that most of the change in the rate of growth is caused in the first hour after rubbing. When DARWIN was used to measure gravitropism in dark grown oat seedlings, it was found that the top side of the shoot contracts during the first hour of gravitational stimulus, whereas the bottom side begins to elongate after 10 to 15 minutes. M.G.

N84-18860*# Wake Forest Univ., Winston-Salem, N.C.
THE ROLES OF CALLOSE, ELICITORS AND ETHYLENE IN THIGMOMORPHOGENESIS AND GRAVITROPISM Abstract Only
Mordecai J. Jaffe *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 54b-54c (For primary document see N84-18829 09-51)
(Grant NAGw-96)
Avail: NTIS HC A06/MF A01 CSCL 06C

A correlation (both temporal and through the inhibitor, 2-deoxy-D-glucose) of callose deposition and ethylene evolution in mechanically perturbed (MP) bean or pine stems or in gravitationally stimulated corn shoots was demonstrated. It was suggested that the callose, which is deposited on the inside of the cell wall, and adjacent to the plasma membrane causes, in some way, the ethylene production. A hypothesis explaining the mechanism is discussed which states that there is a chemical activation of the enzyme system by the callose which is being deposited in apposition with it. Experimental data supporting the hypothesis are presented. M.G.

N84-18861*# Pennsylvania State Univ., University Park.
BIOPHYSICAL MECHANISM OF DIFFERENTIAL GROWTH DURING GRAVITROPISM Abstract Only
Daniel Cosgrove *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 55-56 (For primary document see N84-18829 09-51)
(Grant NAGw-480)
Avail: NTIS HC A06/MF A01 CSCL 06C

A research project is described the goal of which is to determine the mechanism of gravitropic curvature in plant stems at the biophysical and the cellular level. The reorientation of plant organs under the influence of gravity is due to differential growth of the upper and lower sides of the organ. The rate of plant cell enlargement is governed by four biophysical parameters: (1) the extensibility of the cell wall; (2) the minimum stress in the cell wall required for wall expansion (the 'yield threshold'); (3) the osmotic pressure difference between the cell contents and the water source; and (4) the hydraulic conductivity of the pathway for water uptake. Gravitropic response must involve differential alteration of one or more of these four parameters on the two sides of the growing organ. Each of these factors will be examined to assess the role it plays in gravitropism. M.G.

N84-18862*# State Univ. of New York, Stony Brook. Dept. of Biochemistry.
CELLS, EMBRYOS AND DEVELOPMENT IN SPACE Abstract Only
Abraham D. Krikorian *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 57-58 refs (For primary document see N84-18829 09-51)
(Grant NsG-7270)
Avail: NTIS HC A06/MF A01 CSCL 06C

Work continues to focus on the demonstrable totipotency of cultured somatic cells of various higher plants and has examined the conditions which regulate this propensity to be controllably released. This was done with special reference to cells obtained from cultured explants of daylily and carrot. For purposes of identifying the variables in question, work was carried out almost exclusively in liquid media. The events that intervene between the aseptic isolation of tissue explants, the culture of small derived units and free cells and the propagation in large numbers of adventive or somatic embryos to plantlets were traced and certain definitive stages at which control is exercised were identified. In daylily, morphologically competent units are now propagated with a high degree of precision in rotated liquid cultures in bulk, and under the conditions of continuous neutralized gravity, the development progresses so that embryo-plantlets are obtained.
Author

N84-18863*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IN VITRO SEED TO SEED GROWTH ON CLINOSTATS Abstract Only
Takashi Hoshizaki *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 59-60 (For primary document see N84-18829 09-51)
(Contract NAS7-918)
Avail: NTIS HC A06/MF A01 CSCL 06C

The effect of a long term micro-gravity environment on the life cycle of plants is unknown. Whether higher plants have evolved to a stage where removal or reduction of gravity is detrimental to plant life cycle and thus fatal to the plant species, is an unanswered question in space plants which were successfully grown through the various stages of their life cycle. Attempts to grow plants as a continuous integral process from seed to seed through one generation were successful until recently. Culture of plants through multiple generations was not accomplished in space nor in ground based studies. The effect of long term simulated weightlessness by growing consecutive generations of plants continuously on clinostats using the cruciferous plants, Arabidopsis thaliana (L.) Heyn. and Cardamine oligosperma Nutt. is being investigated.
Author

N84-18864*# Pennsylvania Univ., Philadelphia.
IMPORTANCE OF GRAVITY FOR PLANT GROWTH AND BE-

HAVIOR Abstract Only
Allan H. Brown *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 61-61a refs (For primary document see N84-18829 09-51)
(Grants NGR-39-010-149; NGR-39-030-010)
Avail: NTIS HC A06/MF A01 CSCL 06C

Accomplishments during the past fiscal year consisted of (1) completion of research on a study of the kinetics of damping out of circummutation when the axially directed g-force was abruptly elimina.d (Research Task NULYRL). (2) Further experiments were accomplished on a comprehensive study, underway for several years, to validate (or invalidate) the use of clinostat rotation as a hypogravity simulation device. (3) Some of our earlier (unpublished) observations on plant seedlings resistance to g-loading were evaluated, interpreted, and a paper was submitted for publication (Research Task HYGEFF). (4) In what has been called "Shuttle middeck locker ecology' an attempt to acquire reliable empirical information on the thermal profile experienced by test packages housed in middeck lockers (MDDL) during shuttle flights at long last seems to be yielding some results. Author

N84-18865*# Loyola Univ., Chicago, Ill.
THE ROLE OF GRAVITY IN LEAF BLADE CURVATURES Abstract Only
Alice Bourke Hayes *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 62-63 (For primary document see N84-18829 09-51)
(Grant NAGw-131)
Avail: NTIS HC A06/MF A01 CSCL 06C

In the past year we have gained useful information on several aspects of leaf blade growth. The most important observations are as follows: The C(14)-1AA moves preferentially in a gravipositive dorsiventral direction through the blade. This movement is inhibited by inversion of the blade. The responding cells in leaf blade hyponasty are in the lower epidermis and bundle sheath cells. Two additional responses in the leaf were characterized. In addition to blade curvature, the leaf shows petiole curvature and changes in the liminal angle subtended by the pulvinus. Ethylene production was studied under a number of conditions. The blade, rather than the petiole or pulvinus, is the principal site of auxin-promoted ethylene synthesis. The effects of a variety of agents on the blade, including gibberellic acid, abscisic acid, vanadate, low pH buffers, and blue light were reviewed. Author

N84-18866*# Houston Univ., Tex.
AROMATIC BIOSYNTHESIS IN PINE TISSUES Abstract Only
Joe R. Cowles *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 64 (For primary document see N84-18829 09-51)
(Grant NsG-9042)
Avail: NTIS HC A06/MF A01 CSCL 06C

Pinus elliotti is a woody plant species responsive to gravity and capable of synthesizing large quantities of lignin. Lignification begins very quickly after germination; lignin is detected in the vascular region within 4 days after germination and rapidly progresses up the hypocotyl. Young pine seedlings bend in response to geostimulation for about 10 days after germination, with the most rapid response time occurring in 4- to 5-day-old seedlings. Various chemicals were used to establish their effects on the geotropic response in this gymnosperm species. IAA completely arrests the geotropic response for 18 to 24 hr. Afterward the seedlings respond geostimulation as if they were not treated. The same pattern of response will occur with a second IAA treatment. If the synthetic auxin, 2-4,D, is used, the georesponse is permanently blocked. The method of application does not appear to be critical; addition of auxin to only one side of the seedling gave results similar to those obtained by treating the entire seedling. Author

N84-18867*# Indiana Univ., Bloomington. Dept. of Biology.
CYTOPLASMIC REARRANGEMENTS ASSOCIATED WITH AMPHIBIAN EGG SYMMETRIZATION Abstract Only
George M. Malacinski *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 65-66 (For primary document see N84-18829 09-51)
(Grant NAGw-60)
Avail: NTIS HC A06/MF A01 CSCL 06C

Cytoplasmic rearrangements which follow fertilization were mentioned in normal and inverted eggs. A set of yolk compartments was resolved by cytological analyses of both normally oriented and inverted eggs. Those compartments were characterized by their yolk platelet compositions and movement during egg inversion. It is found that during egg inversion the yolk compartments shift minor cytoplasmic compartments which line the egg cortex. Those yolk mass shifts occurred only after the inverted egg was activated. The direction of shift of the major yolk components, rather than the sperm entrance site, determines the dorsal/ventral polarity of the inverted egg. Among different spawnings the rate of shift varied. Eggs that displayed the fastest rate of shift exhibited the highest frequency of developmental abnormalities during organogenesis. Interpretation of novel observations on cytoplasmic organization provide criticism of some earlier models. A new density compartment model is presented as a coherent way to view the organization of the egg cytoplasm and the development of bilateral symmetry. Author

N84-18868*# Columbia Univ., New York. Dept. of Human Genetics and Development.
EFFECTS OF SIMULATED WEIGHTLESSNESS ON MAMMALIAN DEVELOPMENT. PART 1: DEVELOPMENT OF CLINOSTAT FOR MAMMALIAN TISSUE CULTURE AND USE IN STUDIES ON MEIOTIC MATURATION OF MOUSE OOCYTES Abstract Only
Debra J. Wolegemuth and George S. Grills *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 67-68 (For primary document see N84-18829 09-51)
(Grant NAGw-346)
Avail: NTIS HC A06/MF A01 CSCL 06C

The effects of weightlessness on three aspects of mammalian reproduction: oocyte development, fertilization, and early embryogenesis was studied. Zero-gravity conditions within the laboratory by construction of a clinostat designed to support in vitro tissue culture were simulated and the effects of simulated weightlessness on meiotic maturation in mammalian oocytes using mouse as the model system were studied. The timing and frequency of germinal vesicule breakdown and polar body extrusion, and the structural and numerical properties of meiotic chromosomes at Metaphase and Metaphase of meiosis are assessed. E.A.K.

N84-18869*# Texas Univ. Health Science Center, Houston. Inst. of Dental Science.
GROWTH AND DIFFERENTIATION OF MAMMALIAN EMBRYONIC TISSUES EXPOSED TO HYPERGRAVITY IN VIVO AND IN VITRO Abstract Only
Pauline Jackie Duke *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 69-70 (For primary document see N84-18829 09-51)
(Grant NAGw-438)
Avail: NTIS HC A06/MF A01 CSCL 06C

In about 10 years or so, men and women from Earth will be long-term inhabitants of a space station aboard which plants and animals will be growing and developing in gravities other than that of Earth. The effect of gravitational changes on development was examined. It is indicated that differentiation is speeded up under excess G and slowed in low or null G. The effects of exposure to excess gravity on fusion of the embryonic mouse secondary palate were studied. During fusion, the palatal shelves first adhere by means of glycoproteins appearing along the medial epithelial edge (MEE). The contacting epithelia then reorganize and undergo programmed cell death, allowing the underlying mesenchymes to come in contact. The process of cell death occurs in vitro at about the same rate that it occurs in vivo. E.A.K.

N84-18870*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Development Genetics and Anatomy.
RODENT CNS NEURON DEVELOPMENT: TIMING OF CELL BIRTH AND DEATH Abstract Only

J. Richard Keefe *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 71-71a (For primary document see N84-18829 09-51)
(Grant NAGw-83)
Avail: NTIS HC A06/MF A01 CSCL 06C

Data obtained from a staged series of single paired injections of tritiated thymidine to pregnant Wistar rats or C57B16/j mice on selected embryonic days and several postnatal times are reported. All injected specimens were allowed to come to term, each litter culled to six pups and specimens were sacrificed on PN28, with fixation and embedding for paraffin and plastic embedding. The results are derived from serial paraffin sections of PN28 animals exposed to autoradiographic processing and plotted with respect to heavily labelled cell nuclei present in the selected brain stem nuclei and sensory ganglia. Counts from each time sample/structure are totalled and the percentage of cells in the total labelled population/structure represented by each injection time interval plotted. E.A.K.

N84-18871*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HYPER-GRAVITATIONAL EFFECTS ON METABOLISM AND THERMOREGULATION Abstract Only
Jiro Oyama *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 72 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Animal hypergravitational effects on metabolism and thermoregulation was studied. The two major problem areas investigated are: initial and short-term exposure effects, and chronic, long-term exposure effects involving developmental and adaptational effects. Investigations focused on: (1) quantifying changes in thermoregulation with graded G-intensities in rats; (2) further delineating the effects of duration on gluconeogenesis, gluconeogenic hormones and substrates, and glucose homeostasis; and (3) reproduction and neonatal survival rates under different G-intensities. E.A.K.

N84-18872*# Dartmouth Coll., Hanover, N.H. Dept. of Anatomy.
FAILURE OF VINCRISTINE INDUCE TWINNING Abstract Only
Michael Binder *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 73 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Mammalian ova do not contain axes of symmetry from which are derived embryonic axes of symmetry. Mammalian axis determination is an early embryologic event occurring at about the time that monozygous twinning in mice. (Kaufma MH & O'Shea KS, 1978, Nature 276:707) and an attempt was made to reproduce their work in several strains of mice. Over 3200 embryos were examined without any twins being found. To rule out the possibility that vincristine caused twinning plus some lethal malformation (with subsequent resorption of the embryo) the embryos were examined 36-60 hours after vincristine treatment. R.J.F.

N84-18873*# California Univ., Berkeley. Dept. of Zoology.
TWINNING OF AMPHIBIAN EMBRYOS BY CENTRIFUGATION Abstract Only
Steven D. Black *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 74 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

In the frog Xenopus laevis, the dorsal structures of the embryonic body axis normally derive from the side of the egg opposite the side of sperm entry. However, if the uncleaved egg is inclined at lg or centrifuged in an inclined position, this topographic relationship is overridden: the egg makes its dorsal axial structures according to its orientation in the gravitational/centrifugal field, irrespective of the position of sperm entry. Certain conditions of centrifugation cause eggs to develop into conjoined twins with two sets of axial structures. A detailed analysis of twinning provided some insight into experimental axis orientation. First, as with single-axis embryos, both axes in twins are oriented according to the direction of centrifugation. One axis forms at the centripetal side of the egg and the other forms at the centrifugal side, even when the side of sperm entry is normal to the centrifugal force vector. Second, if eggs are centrifuged to give twins, but are inclined at lg to prevent post-centrifugation endoplasmic redistributions, only single-axis embryos develop. Thus, a second redistribution is required for high-frequency secondary axis formation. This can be accomplished by lg (as in the single centrifugations) or by a second centrifugation directed along the egg's animal-vegetal axis. R.J.F.

N84-18874*# Texas Univ. Health Science Center, Dallas. Div. of Cardiology.
CARDIAC CHAMBER VOLUMES BY ECHOCARDIOGRAPHY USING A NEW MATHEMATICAL METHOD: A PROMISING TECHNIQUE FOR ZERO-G USE Abstract Only
Jay C. Buckey, James M. Beattie, F. Andrew Gaffney, J. V. Nixon, and C. Gunnar Blomqvist *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 75 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Accurate, reproducible, and non-invasive means for ventricular volume determination are needed for evaluating cardiovascular function zero-gravity. Current echocardiographic methods, particularly for the right ventricle, suffer from a large standard error. A new mathematical approach, recently described by Watanabe et al., was tested on 1 normal formalin-fixed human hearts suspended in a mineral oil bath. Volumes are estimated from multiple two-dimensional echocardiographic views recorded from a single point at sequential angles. The product of sectional cavity area and center of mass for each view summed over the range of angles (using a trapezoidal rule) gives volume. Multiple (8-14) short axis right ventricle and left ventricle views at 5.0 deg intervals were videotaped. The images were digitized by two independent observers (leading-edge to leading-edge technique) and analyzed using a graphics tablet and microcomputer. Actual volumes were determined by filling the chambers with water. These data were compared to the mean of the two echo measurements. R.J.F.

N84-18875*# National Inst. of Mental Health, Bethesda, Md. Heart, Lung and Blood Inst.
PRESYNAPTIC ELEMENTS INVOLVED IN THE MAINTENANCE OF THE NEUROMUSCULAR JUNCTION Abstract Only
George Howard Burrows *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 76 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Alterations in the neuromuscular junction were observed in rats preceding loss of muscle mass. In view of the possibility that these alterations involve changes in the secretion of myotrophic agents by presynaptic motor neurons, an investigation was undertaken to characterize a neuronall factor which is thought to be involved in the initiation and maintenance of cholinergic synapses. This factor, which is secreted into the incubation medium by NG108-15 neuroblastoma x glioma hybrid cells, induces the aggregation of nicotinic acetylcholine receptors on primary cultures of rat hindlimb myotubes. Previous attempts to purify this factor failed. Extensive washing of the NG108-15 cells with hepes-buffered salt solution followed by short (4 hour) collection times resulted in the collection of incubation medium containing maximal aggregation activity with as little as 5 ug secreted protein per ml of fresh medium. A three-fold increase in specific activity was obtained after anion exchange chromatography. R.J.F.

N84-18876*# Texas A&M Univ., College Station. Dept. of Plant Sciences.
IDENTIFICATION OF A VOLATILE PHYTOTOXIN FROM ALGAE Abstract Only
John S. Garavelli, Franklin Fong, and Edward A. Funkhouser *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 77 (For primary document see N84-18829 09-51)
(Grants NAGw-70; NCC-2-102)
Avail: NTIS HC A06/MF A01 CSCL 06C

The objectives were to develop a trap system for isolating fractions of volatile algal phytotoxin and to characterize the major components of the isolated phytotoxin fractions. A bioassay using

Phaseolus vulgaris seedlings was developed to aid in investigating the properties of the phytotoxin produced by cultures of Euglena gracilis var. bacillaris and Chlorella vulgaris. Two traps were found, 1.0 M hydrochloric acid and 0 C, which removed the phytotoxin from the algal effluent and which could be treated to release that phytotoxin as judged with the bioassay procedure. It was also determined that pretraps of 1.0 M sodium hydroxide and 1.0 M potassium biocarbonate could be used without lowering the phytotoxin effect. Ammonia was identified in trap solutions by ninhydrin reaction, indophenol reaction and derivatization with dansyl chloride and phenylisothiocyanate. Ammonia at the gaseous concentrations detected was found to have the same effects in the bioassay system as the volatile phytotoxin. It is possible that other basic, nitrogen containing compounds which augment the effects of ammonia were present at lower concentrations in the algal effluent. R.J.F.

N84-18877*# Rockefeller Univ., New York. Lab. of Plant Molecular Biology.

PEA AMYLOPLAST DNA IS QUALITATIVELY SIMILAR TO PEA CHLOROPLAST DNA Abstract Only

John J. Gaynor *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 78 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Amyloplast DNA (apDNA), when subjected to digestion with restriction endonucleases, yields patterns nearly identical to that of DNA from mature pea chloroplasts (ctDNA). Southern transfers of apDNA and ctDNA, probed with the large subunit (LS) gene of ribulose-1,5-bisphosphate carboxylase (Rubisco), shows hybridization to the expected restriction fragments for both apDNA and ctDNA. However, Northern transfers of total RNA from chloroplasts and amyloplasts, probed again with the LS gene of Rubisco, shows that no detectable LS meggage is found in amyloplasts although LS expression in mature chloroplasts is high. Likewise, two dimensional polyacrylamide gel electrophoresis of etiolated gravisensitive pea tissue shows that both large and small subunits of Rubisco are conspicuously absent; however, in greening tissue these two constitute the major soluble proteins. These findings suggest that although the informational content of these two organelle types is equivalent, gene expression is quite different and is presumably under nuclear control. R.J.F.

N84-18878*# Washington Univ., St. Louis, Mo. Dept. of Biology.

PARTICIPATION OF ETHYLENE IN GRAVITROPISM Abstract Only

Marcia Harrison and Barbara G. Pickard *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 79 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

In shoots of many plants, of which tomato (Lycopersicon esculentum Mill.) is an example, ethylene production is substantially increased during gravitropism. As a first step toward elucidating the role of ethylene in gravitropism, detailed time courses of ethylene production in isolated hypocotyl segments and whole plants were measured for gravistimulated and upright tomato seedlings. In the first experiment, seedlings were set upright or laid horizontal and then, at 15 min intervals, sets of hypocotyls were excised and sealed into gas tight vials. A steady long term rise in ethylene production begins after 15 min gravistimulation. It is possible that this increase is a consequence of the accumulation of indoleacetic acid (IAA) in the lower tissue of the hypocotyle. In a second kind of experiment, whole seedlings were enclosed in sealed chambers and air samples were withdrawn at 5 min intervals. Stimulated seedlings produced more ethylene than controls during the first 5 min interval, but not appreciably more during the second. This suggests the possibility that the ethylene production induced during the first 5 min occurs immediately rather than after a lag, and thus much too soon to be controlled by redistribution of IAA. R.J.F.

N84-18879*# Houston Univ., Tex. Dept. of Biology.

INTERACTIONS OF LIGHT AND GRAVITY ON GROWTH, ORIENTATION, AND LIGNIN BIOSYNTHESIS IN MUNG BEANS Abstract Only

Gary C. Jahns *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 80 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Mung beans (Vigna radiata L.) seedlings grown on the third Space Transport Mission (STS-3) showed marked orientation problems (some of the stems elongated horizontally and many of the roots were growing upward) and had a lower lignin content than the ground based controls. This research was initiated to determine if the atypical growth characteristics of mung beans grown in microgravity could be simulated using horizontal clinostats. Most of the effort focused on the design, construction and testing of the clinostats. In order to closely approximate the growth conditions of the plants grown in the plant growth unit on STS-3, cylindrical lexan minichambers were constructed. Results showed that plants grown using these clinostats in the horizontal position exhibit similar growth characteristics to the plants grown on STS-3 (disorientation of both stems and roots), while the vertical stationary and vertical rotating controls exhibit normal growth. R.J.F.

N84-18880*# Michigan Univ., Ann Arbor. Dept. of Anatomy and Cell Biology.

CELLULAR LOCALIZATION OF Na(+), K(+)-ATPase IN THE MAMMALIAN VESTIBULAR SYSTEM Abstract Only

Thomas P. Kerr *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 81-82 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Two different, but complementary, procedures for cellular localization of Na+, K+-ATPase in the guinea pig vestibular system were employed. One of these techniques, devised by Stirling, depends upon the well documented ability of the specific inhibitor ouabain to bind selectively to Na+,K+-ATPase, blocking catalytic activity. Microdisected vestibular tissues are incubated with tritium-labelled (3H-) ouabain, and regions with a high concentration of Na+,K+-ATPase are subsequently identified by light microscope autoradiography. A second method, originated by Ernst, detects inorganic phosphate released from an artificial substrate (nitrophenyl phosphate) by catalytic activity of the enzyme. In the presence of strontium ion, phosphate is precipitated near regions of high activity, then converted to a product which may finally be visualized in the electron microscope. This cytochemical enzymatic reaction is inhibited by ouabain. R.J.F.

N84-18881*# National Inst. of Mental Health, Bethesda, Md. Lab. of Clinical Science.

BIOASSAY, ISOLATION AND STUDIES ON THE MECHANISM OF ACTION OF NEURITE EXTENSION FACTOR Abstract Only

Douglas Kligman *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 83 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

The identification and purification of molecules active in promoting neurite outgrowth requires a sensitive reproducible bioassay. A quantitative bioassay was utilized to purify a neurite extension factor (NEF) based on counting the number of phase bright neurons with processes at least equal to one cell body diameter after 20 hrs. in culture is defined, serum free medium. Using a combination of heat treatment DEAE cellulose chromatography and gel filtration, an acidic protein of M sub r = 75,000 was highly purified. Upon reduction, it yields subunits of M sub r = 37,000. Purified fractions are active half maximally at 100 ng/ml in inducing neurite outgrowth in this bioassay. Currently, monoclonal antibodies to NEF are being produced. Female Balb C mice were immunized with the antigen and fusions with mouse myeloma cells will be performed to yield hybridoma cells. R.J.F.

N84-18882*# Stanford Univ., Calif. Dept. of Biological Sciences.

ISOLATION AND CHARACTERIZATION OF BETA-GLUCAN SYNTHASE: A POTENTIAL BIOCHEMICAL REGULATOR OF GRAVISTIMULATED DIFFERENTIAL CELL WALL LOOSENING

Abstract Only
Konrad M. Kuzmanoff *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 84 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

In plants, gravity stimulates differential growth in the upper and lower halves of horizontally oriented organs. Auxin regulation of cell wall loosening and elongation is the basis for most models of this phenomenon. Auxin treatment of pea stem tissue rapidly increases the activity of Golgi-localized Beta-1,4-glucan synthase, an enzyme involved in biosynthesis of wall xyloglucan which apparently constitutes the substrate for the wall loosening process. The primary objective is to determine if auxin induces de novo formation of Golgi glucan synthase and increases the level of this glucan synthase mRNA. This shall be accomplished by (a) preparation of a monoclonal antibody to the synthase, (b) isolation, and characterization of the glucan synthase, and (c) examination for cross reactivity between the antibody and translation products of auxin induced mRNAs in pea tissue. The antibody will also be used to localize the glucan synthase in upper and lower halves of pea stem tissue before, during and after the response to gravity. Author

N84-18883*# Millsaps Coll., Jackson, Miss. Dept. of Biology.
RHEOCEPTIVE MEDIATORS OF GRAVIPERCEPTION IN A WATER FLEA: MORPHOLOGICAL IMPLICATIONS OF ANTENNAL-SOCKET SETAE IN DAPHNIA MAGNA Abstract Only
Dewey G. Meyers *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 85 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Aquatic microcrustaceans of the genus Daphnia are known to orient to light during the day. At night, in the absence of visual cues, daphnids were suspected of maintaining equilibrium by monitoring the direction of gravity through their swimming antennae. Recent investigations using simulated, weightlessness conditions coupled with absence of illumination revealed hair like structures or setae on the basal, articulating socket of the antennae that, when surgically removed, resulted in disorientation. Given the simulated weightlessness or neutrally buoyant condition that eliminated sinking of the normally negatively buoyant Daphnia, it was proposed that the antennal socket setae function as rheoceptors stimulated by the upward rush of water currents during gravity induced, sinking phase of daphnid swimming movements. This rheoceptively mediated, gravity perception hypothesis is further supported by morphological investigations. Scanning electron micrographs indicate that antennal socket setae are anatomically similar to proprioceptors used by higher crustaceans to monitor gravitational direction. R.J.F.

N84-18884*# Louisville Univ., Ky. Dept. of Physiology and Biophysics.
EFFECTS OF SUSPENSION ON TISSUE LEVELS OF GLUCOCORTICOID RECEPTORS Abstract Only
Joseph M. Steffen *In* NASA. Washington NASA Space Biol. Program Feb. 1984 p 86 (For primary document see N84-18829 09-51)
Avail: NTIS HC A06/MF A01 CSCL 06C

Differential muscle responses can be simulated by hypokinetic/hypodynamic (H/H) suspension of rats with complete unloading of the hindlimb muscles. Since mechanism(s) underlying these atrophic effects were not clearly elucidated, experiments were initiated to investigate a possible role for glucocorticoids in the physiological and biochemical responses to H/H. The principal objective was to assess the potential for alterations in peripheral responsiveness to glucocorticoids in response to H/H. Studies have initially focused on the determination of tissue levels of glucocorticoid receptors as one index of hormonal sensitivity at the cellular level. Four hindlimb muscles (soleus, gastrocnemius, plantaris and EDL), previously demonstrated to exhibit differential responses to H/H, were investigated. Receptor levels in other glucocorticoid sensitive tissues (heart, liver, and kidney) were determined. Male rats (180-200g) were suspended for 7 or 14 days, sacrificed by cervical dislocation, and the tissues excised. R.J.F.

N84-18885*# California Univ., Davis.
AVIAN EMBRYONIC DEVELOPMENT IN HYPERDYNAMIC ENVIRONMENTS Final Report, 1 Oct. 1978 - 31 Mar. 1982
U. K. Abbott and A. H. Smith [1983] 13 p refs
(Grant NsG-7493)
(NASA-CR-173339; NAS 1.26:173339) Avail: NTIS HC A02/MF A01 CSCL 06C

Embryos which developed for 24 hours in the oviduct of hens maintained at 2 G and which were subsequently incubated at Earth gravity had a 14% reduction in hatchability. Increased mortality during the first 4 days, and an increase in embryonic abnormalities were of the types usually found during the first mortality peak (2-3 days). Embryos in eggs that were produced at Earth gravity and continued their development on the centrifuge at fields of 2 G or less did not appear to be greatly affected by the treatment. At 4 G, 91% of the embryos died, mostly on the first and second days of incubation. Abnormalities prominent in the centrifuged eggs include: (a) a failure of the primitive streak to develop; (b) interference with the development of the axial skeleton; (c) multiple hemorrhages, mostly petechial which is consistent with capillary fragility; and (d) retardation of embryo growth, possibly caused by an interference with gaseous diffusion, the result of an acceleration-induced increase in gas density in the centrifuging incubator. Author

N84-18886*# Rice Univ., Houston, Tex.
FLUID MECHANICAL ASPECTS OF CELL CULTURE Final Report
J. D. Hellums 29 Oct. 1982 5 p
(Contract NAS9-16433)
(NASA-CR-171749; NAS 1.26:171749) Avail: NTIS HC A02/MF A01 CSCL 06C

The influence of shear rate on cell cultures was determined. Cells were cultured on a flat substrate in a specially designed flow chamber in which shear rate is known and controlled. Author

N84-18887*# Tufts Univ., Boston, Mass. Musculo-Skeletal Research Group.
STATIC VERSUS DYNAMIC LOADS AS AN INFLUENCE ON BONE REMODELLING
L. E. Lanyon and C. T. Rubin [1983] 24 p refs Sponsored in part by MRC, England
(Grant NAG9-25)
(NASA-CR-173365; NAS 1.26:173365) Avail: NTIS HC A02/MF A01 CSCL 06C

Bone remodelling activity in the avian ulna was assessed under conditions of disuse alone, disuse with a superimposed continuous compressive load, and disuse interrupted by a short daily period of intermittent loading. The ulna preparation is made by two submetaphyseal osteotomies, the cut ends of the bone being covered with stainless steel caps which, together with the bone they enclosed, are pierced by pins emerging transcutaneously on the dorsal and ventral surfaces of the wing. The 110 mm long undisturbed section of the bone shaft can be protected from functional loading, loaded continuously in compression by joining the pins with springs, or loaded intermittently in compression by engaging the pins in an Instron machine. Similar loads (525 n) were used in both static and dynamic cases engendering similar peak strains at the bone's midshaft (-2000 x 10-6). The intermitent load was applied at a frequency of 1 Hz during a single 100 second period per day as a ramped square wave, with a rate of change of strain during the ramp of 0.01 per second. Author

N84-18888*# Tufts Univ., Boston, Mass. Dept. of Anatomy and Cellular Biology.
REGULATION OF BONE MASS BY MECHANICAL STRAIN
Clinton T. Rubin and Lance E. Lanyon 14 Mar. 1984 12 p refs Sponsored in part by MRC, England
(Grant NAG9-25)
(NASA-CR-173363; NAS 1.26:173363) Avail: NTIS

HC A02/MF A01 CSCL 06C

By applying controlled intermittent loads in vivo to a bone protected from alternative sources of loading, it was possible to demonstrate a graded dose:response relationship between peak load and change in tissue mass. Only 100, 10.0 Hz cycles per day of loads producing physiological strain magnitudes and rates were necessary to elicit this adaptive response. Both increases and decreases in bone mass were achieved by increased cellular activity. The osteogenic response was practically unaccompanied by concurrent resorption, whereas reduction in bone mass was achieved by a response in which resorption predominated over formation. Author

N84-18889*# Tufts Univ., Medford, Mass. Dept. of Anatomy and Cellular Biology.

CONTROL OF BONE REMODELLING BY APPLIED DYNAMIC LOADS Final Report

Lance E. Lanyon and Clinton T. Rubin [1984] 3 p refs (Grant NAG9-25)

(NASA-CR-173287; NAS 1.26:173287) Avail: NTIS HC A02/MF A01 CSCL 06C

The data showing the relationship between bone mass and peak strain magnitude prepared and submitted for publication. The data from experiments relating remodelling activity with static or dynamic loads were prepared and submitted for publication. Development of programs to relate the location cf remodelling activity with he natural and artificial dynamic strain distributions continued. Experiments on the effect of different strain rates on the remodelling response continued. Author

N84-18890# Washington Univ., Seattle. Lab. for Bioelectromagnetics Research.

EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 3: SAR (SPECIFIC ABSORPTION RATE) IN RATS EXPOSED IN 2450-MHz CIRCULARLY POLARIZED WAVEGUIDE Final Report, Jun. 1980 - Dec. 1982

Chung-Kwang Chou, A. W. Guy, and R. B. Johnson Oct. 1983 29 p 3 Vol.

(Contract F33615-80-C-0612; AF Proj. 7757)

(AD-A135376; SAM-TR-83-19) Avail: NTIS HC A03/MF A01 CSCL 06/18

The average SARs for live rats exposed in 2450-MHz circularly polarized waveguides were estimated from the total system loss measured by five power meters and by the use of a correction factor representing the ratio between actual SAR (measured by twin-well calorimetry) and apparent SAR (measured by power meters) for various body masses and five orientations. In the waveguides, the average SAR changed less than threefold when the rats grew from 200 to 700 g and when they moved around in the cage. The ratio of peak of average SAR in the body of the rats was less than 3. These results indicate uniform energy disposition in rats exposed in the circular waveguide. Author (GRA)

N84-18891# Washington Univ., Seattle. Lab. for Bioelectromagnetics Research.

EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 2: AVERAGE SAR AND SAR DISTRIBUTION IN MAN EXPOSED TO 450-MHz RFR Final Report, Jun. 1980 - Dec. 1982

Arthur W. Guy, Chung-Kwang Chou, and Barry Neuhaus Sep. 1983 110 p 2 Vol.

(Contract F33615-80-C-0612; AF Proj. 7757)

(AD-A135455; SR-19; SAM-TR-83-18) Avail: NTIS HC A06/MF A01 CSCL 06/18

This volume presents the methodology for and results of estimating values for the average SAR and the SAR distribution in man exposed to 1-mW/sq cm 450-MHz radiofrequency radiation for various polarizations and body positions. The results were obtained by calorimetry and thermography from 1/5 scaled models of man and were analyzed by an interactive computer system. The mean SAR as averaged over the body remained relatively constant at 0.050 W/kg, with a standard deviation of + or - .007 W/kg for all exposure polarization conditions and body postures. Peak SAR values were as high as 0.650 W/kg, occurring typically in the wrist. GRA

N84-18254# Joint Publications Research Service, Arlington, Va.

BIOMEDICAL EXPERIMENTS ON SOVIET-FRENCH FLIGHT

Ye. I. Vorobyev and A. R. Krotovskaya *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 47-55 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 18-22 (For primary document see N84-18247 09-12)

Avail: NTIS HC A06

N84-18255# Joint Publications Research Service, Arlington, Va.

DEVELOPMENT OF SPACE BOTANY EXPERIMENTS

Aleksandr Mashinskiy and Galina Nechitaylo *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 56-63 Transl. into ENGLISH from Tekhn.-Molodezhi (Moscow), no. 4, Apr. 1983 p 2-7 (For primary document see N84-18247 09-12)

Avail: NTIS HC A06

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-18892 City Univ., London (England). Dept. of Visual Sciences.

EYE SPECTRAL SENSITIVITY AND ITS VARIATION WITH LUMINANCE LEVEL

P. W. Trezona and J. Laycock Farnborough, England RAE 16 May 1983 39 p refs

(RAE-TR-83043; RAE-FS(F)-205; BR88788) Copyright. Avail: Issuing Activity

The variance of the human eyes' luminous efficiency, V (lambda) over the luminance range of emissive display devices was tested. Experiments on a 2 deg field, with a dark surround, were performed on 4 normal observers to determine the spectral sensitivity curve at each of 5 luminance levels ranging from 1 to 2000 fL. Spectral sensitivity curves used the flicker photometry method, and at 1 fL yield a curve similar to V (lambda) but higher for blues and greens. At 10 fL there is a marked decrease in red sensitivity and at 100 fL a much smaller decrease in green sensitivity. Curves at the higher levels are much narrower and more pointed than V (lambda) and show much lower precision and greater observer variability. Observer variation is greatest for blue wavelengths. Author (ESA)

N84-18893 Defence Research Information Centre, Orpington (England).

ERGO-OPHTHALMOLOGICAL ASPECTS OF THE VDU: VISUAL STRAIN AND THE BLUE LIGHT LESION

L. Barca and F. Passani Oct. 1983 13 p refs Transl. into ENGLISH from Atti della Fond. Giorgio Ronchi (Italy), Vol. 31, No. 1, 1982 p 107-115

(DRIC-T-6921; BR89834) Copyright. Avail: Issuing Activity

Factors responsible for the sensation of weariness, visual fatigue and discomfort claimed by operators of visual display units after prolonged periods of watching the screen are discussed. The spectral emissions of the phosphors used are examined. Their potential risk, and the so-called blue light lesion, are considered. Author (ESA)

N84-18894# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

AIRBORNE PENETRATION OF RADIOACTIVE CLOUDS M.S. Thesis

T. R. Kling Mar. 1983 93 p

(AD-A135848; AFIT/GNE/PH/83M-7) Avail: NTIS HC A05/MF A01 CSCL 18/8

This report evaluates the threat to aircrew members when their aircraft approaches and subsequently penetrates a de-

scending radioactive cloud generated by a nuclear weapon surface burst. The re-development of Hickman's program consists of a remodeling of the computational methods for sky-shine dose and cloud model. The code also computes the ionizing dose rate an air crew member receives when flying through the radioactive cloud as a function of time. The code computes the doses by considering the cloud size, the aircraft's transit time, the ingestion rate of radioactive particles, the aircraft's distance to the burst, and the aircraft's altitude. A simple extension of the computer code computes the dose received from multiple bursts. The results show that at 9500 meters (about 31,000 feet), the total dose to each aircrew member is about 5 rem after flying through the cloud 1 hour after cloud stabilization. The multiple burst dose is approximately 204 rem under the same conditions as the single burst case. Both the single and multiple burst case use a mission completion time of 8 hours after entering the cloud. GRA

N84-18895# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.
ANALYSIS OF THE KINEMATIC PROPERTIES DATA OF THE SHOULDER COMPLEX DURING FORCED MOTION Final Report, 1 Jan. - 31 Jul. 1982
Ali Erkan Engin Wright-Patterson AFB, Ohio AMRL Aug. 1983 59 p
(Contract F33615-81-C-0500; AF Proj. 7231)
(AD-A135913; AFAMRL-TR-83-067) Avail: NTIS HC A04/MF A01 CSCL 06/2

This report, first, presents a brief introduction dealing with kinematics measured by means of sonic emitters and a special application of this technique to the shoulder complex. This is followed by a presentation of a new data collection methodology and analysis of the sonic emitters data by utilization of the three most accurate sonic emitters out of six located on the arm cuff of the test subject. Numerical results are provided for three male subjects in the form of plots showing passive resistance of the shoulder complex as functions of drawer displacements of the upper arm for its several orientations with respect to the torso.
Author (GRA)

N84-18896# California Univ., Irvine, Dayton, Ohio.
TOXIC HAZARDS RESEARCH UNIT REPORT, 1983 Annual Technical Report, Jun. 1982 - Jun. 1983
J. D. MacEwen and E. H. Vernot Wright-Patterson AFB, Ohio Aerospace Medical Research Lab. Oct. 1983 224 p
(Contract F33615-80-C-0512; AF Proj. 6302)
(AD-A136170; AFAMRL-TR-83-64; ATR-20) Avail: NTIS HC A10/MF A01 CSCL 06/20

The research program of the Toxic Hazards Research Unit (THRU) for the period of June 1982 through May 1983 is reviewed in this report. Chronic toxicity and oncogenic studies were carried out with hydrazine, Otto Fuel 2, JP-7, JP-8, and JP-TS. A series of acute toxicity studies was conducted on a variety of chemicals and chemical agents used by the Army, Air Force, and Navy. Neurotoxicity and subchronic inhalation studies were conducted on several hydraulic fluids. GRA

N84-18897# SRI International Corp., Menlo Park, Calif. Life Sciences Div.
NEUROPHYSIOLOGICAL BASES OF EVENT-RELATED POTENTIALS Annual Report, 1 May 1982 - 30 Apr. 1983
C. S. Rebert, W. J. Donovan, K. H. Pribram, and J. E. Evans Jun. 1983 81 p Prepared in cooperation with Stanford Univ.
(Contract F49620-82-K-0016; AF Proj. 2313)
(AD-A135263; AFOSR-83-0902TR; AR-1) Avail: NTIS HC A05/MF A01 CSCL 06/16

In order to more fully understand the physiological and psychological significance of event-related potentials, cortical and subcortical recordings are being obtained form monkeys performing in operant-conditioning tasks, Six animals were trained on initial phases of the cued reaction-time task at SRI International and were subsequently implanted with electrodes capable of recording transient and sustained evoked potentials and massed-unit activity. Two monkeys were trained on initial phases of an oddball task at Stanford University, and electrodes are being prepared so that the subcortical generators of the P300 wave can be assessed in these animals. An LSI-11/23 computer system was installed at SRI to implement the cued reaction-time task and to collect event-related potentials. Preliminary recordings of slow potentials and massed-unit activity were collected from the lateral geniculate nucleus of one cat to evaluate the performance of modified amplifiers, and transient (P300) and sustained (contingent negative variation) evoked potentials were recorded from the scalps of human subjects to confirm appropriate performance of the laboratory system. Author (GRA)

N84-18898# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
ANTHROPOMETRIC AND MASS DISTRIBUTION CHARACTERISTICS OF THE ADULT FEMALE
Joseph W. Young, Richard F. Chandler, Clyde C. Snow, Kathleen M. Robinette (AFAMRL), Gregory F. Zehner (Anthropology Research Project, Inc.), and Maureen S. Lofberg (USAF Hospital George) 1983 109 p Sponsored in part by National Highway Traffic Safety Administration
(AD-A135316; FAA-AM-83-16) Avail: NTIS HC A06/MF A01 CSCL 06/14

This study of 46 living adult females is part of a long-range research program designed to establish valid analytical relationships between readily measured body dimensions and mass distribution characteristics of living populations. Presented in this report are data describing the mass distribution characteristics of primary and composite body segments. The report also contains sets of regression equations which can be used to predict segmental volumes and moments of inertia from anthropometric data. The data base is derived from both classical anthropometric measurements and from stereophotogrammetric techniques. Subjects were representative of a general United States population as defined by the 1971-74 Public Health Service, Health and Nutrition Examination Survey (HANES). The data obtained described segment and segment composite volumes, centers of volume, intersegment cut centroids, principal inertial axes, and surface anatomical landmarks with respect to anatomical axes developed for each segment. Experiments designed to test the validity of research techniques and controls, and to measure the differences between stereophotometrically derived values and values obtained by direct measurement techniques are also described here. GRA

N84-18899# EEG Systems Lab., San Francisco, Calif.
SINGLE TRIAL BRAIN ELECTRICAL PATTERNS OF AN AUDITORY AND VISUAL PERCEPTUOMOTOR TASK Interim Progress Report, 22 Feb. 1982 - 1 Jun. 1983
Alan S. Gevins, Steven L. Bressler, Brian A. Cutillo, Joseph C. Doyle, Robert S. Tannehill, and Gerald M. Zeitlin Jun. 1983 91 p
(Contract F49620-82-K-0006; AF Proj. 2313)
(AD-A135545; AFOSR-83-1014TR) Avail: NTIS HC A05/MF A01 CSCL 06/16

This past year the proposed auditory-visual preceptuomotor paradigm was designed and implemented, and 12 twenty-one channel pilot recordings were conducted. The objective was to compare spatiotemporal brain-potential patterns associated with: (1) the preparation to receive auditory or visual numeric stimuli, and (2) the processing of auditory and visual numeric stimuli. A bimodal paradigm sufficiently controlled for the application of a 49 channel Neurocognitive Pattern (NCP) Analysis has been finalized and participant screening sessions have begun. Sections 3 and 4 of this Interim Progress Report are comprised of publihsed (Science, 220:97-99, 1983) and in preparation papers describing our recent visuospatial move/no-move study. The results of further signal processing studies on that data are described in Sections 5 and 6. GRA

N84-18900# European Space Agency, Paris (France).
MICROGRAVITY AS AN ADDITIONAL TOOL FOR RESEARCH IN HUMAN PHYSIOLOGY WITH EMPHASIS ON SENSORIMO-

TOR SYSTEMS
G. Clement (CNRS, Paris) and J. Droulez (CNRS, Paris) Sep. 1983 54 p refs
(Contracts ESA-82/17; ESA-82/18)
(ESA-BR-15; ISSN-0250-1589) Avail: NTIS HC A04/MF A01; ESA, Paris FF6 Member States, AU, CN and NO (+20% others)

Research in sensory systems (visual, vestibular, auditory and perception systems) and sensorimotor functions (sensorimotor coordination, balance, orientation, fatigue, motion sickness) as well as equipment to be deployed in the Spacelab Anthrorack are described. Past investigations on human sensorimotor system and the status of ground based microgravity simulation studies and techniques are reviewed. Measurements to be carried out during spaceflights, and stimuli to be applied to the human test subject are listed. Author (ESA)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-18901# Air Force Human Resources Lab., Brooks AFB, Tex. Operationns Training Div.
VELOCITY CONTROL DECISION-MAKING ABILITY: RELATIONSHIP TO FLYING CAPABILITY AND EXPERIENCE Interim Report, 1 Jun. 1981 - 1 Dec. 1982
Joseph C. DeMaio Dec. 1983 19 p
(AF Proj. 2313)
(AD-A136546; AFHRL-TP-83-32) Avail: NTIS HC A02/MF A01 CSCL 05/9

Research investigated the ability of pilots of differing experience and capability to make vehicle control decisions. Three groups of pilots and three groups of pilot trainees performed the flight decision making assessment task (FDAT). The FDAT is a microcomputer based, discretetime vehicle control task. Differences in FDAT performance were found as a function of pilot capability. Results are discussed in terms of pilot capability and of decision factors involved in vehicle control. Author (GRA)

N84-18902*# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychiatry.
POSITIVE AND NEGATIVE REINFORCEMENT EFFECTS ON BEHAVIOR IN A THREE-PERSON MICROSOCIETY
H. H. Emurian, J. V. Brady, J. L. Meyerhoff, and E. H. Mougey 1 Dec. 1983 62 p Submitted for publication
(Grant NGR-21-001-111; Contract N00014-80-C-0467; NR Proj. 170-910)
(NASA-CR-173164; NAS 1.26:173164; AD-A135262; TR-ONR-9) Avail: NTIS HC A04/MF A01 CSCL 05J

Three-person groups of males (G1, G2, and G4) and females (G3) resided for 6 to 12 days in a continuously programmed environment. Subjects followed a behavioral program that determined the sequential and contingent relationships within an inventory of activities. During a positive reinforcement day, each work unit completed by a subject incremented a group account that was divided evenly among the 3 participants at the study's conclusion. During a negative reinforcement day, no money was earned, and the group was assigned a work unit criterion to accomplish to avoid a reduction in accumulated earnings. During avoidance days, subjects exhibited aggressive responses, which differed in magnitude among the 4 groups, as determined from several distinct behavioral measures that reflected the overall status of the microsociety. These effects appear to fall within the conceptual and procedural framework that encompasses analyses of by-products of aversive control, and they suggest that similar variables are operative. GRA

N84-18903# Catholic Univ. of America, Washington, D.C. Lab. for Human Performance.
THE EFFECT OF STRUCTURED CONTEXTUAL TONES ON PSYCHOPHYSICAL FREQUENCY DISCRIMINATION
Kevin B. Bennett, James A. Ballas, and James H. Howard, Jr. 14 Oct. 1983 39 p
(Contract N00014-79-C-0550; NR Proj. 196-159; RR0420901)
(AD-A135433; TR-83-21-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

Six musically and six non-musically trained observers listened to patterns composed of 11 tones of short duration (40 ms). Using a same-different psychophysical procedure observers were asked to report frequency changes in the middle tone of the pattern. Three experimental conditions were formed: constant, random, and structured. In the constant condition observers listened to a single pattern. The observers in the structured and random conditions listened to 12 patterns, but the tonal patterns in the structured condition were arranged to reflect structural rules. Musical training made no difference, but magnitude of the frequency change was highly significant in discrimination performance. A non-parametric statistical analysis revealed a significant effect among the three conditions. It was demonstrated that a structured pattern of tones provided a knowledge source from which observers could effectively abstract information for frequency discrimination judgements. Author (GRA)

N84-18250# Joint Publications Research Service, Arlington, Va.
COSMONAUT TRAINING
A. G. Nikolayev *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 15-19 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 2-7 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

N84-18251# Joint Publications Research Service, Arlington, Va.
BEREGOVOY ON COSMONAUT TRAINING
Avn G. Beregovoy *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 20-24 Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 4, Apr. 1983 p 1-2 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-18904# Naval Submarine Medical Research Lab., Groton, Conn.
COLD WEATHER GOGGLES. 6: EFFECTIVENESS OF YELLOW FILTERS Interim Report
S. M. Luria, J. Wong, and R. Rodriguez 22 Nov. 1983 23 p
(M00-95)
(AD-A136241; NSMRL-1011-6) Avail: NTIS HC A02/MF A01 CSCL 06/17

The visibility of bright and dark targets was compared when viewed through yellow filters whose excitation purity ranged from 0.06 to 0.98 as well as a neutral filter and whose total transmittances had been roughly equated. The visibility of large bright targets was enhanced by all the yellow filters but only to a very small degree. The visibility of the dark targets was also slightly enhanced, but these differences were not statistically significant. The color perception of both color normals and red green dichromats was not affected by yellow filters whose excitation purity was less than 0.20. GRA

N84-18905# Carnegie-Mellon Univ., Pittsburgh, Pa. Leg Lab.
DYNAMICALLY STABLE LEGGED LOCOMOTION Progress Report, Oct. 1982 - Oct. 1983
Marc H. Raibert, H. Benjamin Brown, Jr., Michael Chepponis, Eugene Hastings, Jeff Koechling, Karl N. Murphy, Seshashayee S. Murthy, and Anthony J. Stentz 13 Dec. 1983 142 p
(Contract MDA903-82-K-0153; ARPA Order 4148)

(AD-A136644; CMU-RI-TR-83-20) Avail: NTIS HC A07/MF A01 CSCL 05/8

This report documents recent progress in exploring active balance for dynamic legged systems. Balance in 3D can be achieved with a very simple control system. The control system has three separate parts, one that controls forward running velocity, one that controls body attitude, and one that controls hopping height. Experiments with a physical 3D machine that hops on just one leg show that it can hop in place, travel at a specified rate, follow simple paths, and maintain balance when disturbed. Top recorded running speed was 2.2 m/sec (4.8 mph). The 3D control algorithms are direct generalizations of those used earlier in 2D, with surprisingly little additional complication. Computer simulations of a simple multi-legged system suggest that many of the concepts that are useful in understanding locomotion with one leg can be used to understand locomotion with several legs. A planar model with two legs trots and bounds with the same three part control decomposition used for the one-legged systems. We have designed a four-legged running machine in order to experiment with balance in systems with more than one leg. The machine is arranged like a large dog, with narrow hips, and a long body. We have begun to study gait in terms of coupled oscillations. We have found that changes in the ratio of leg stiffness to hip stiffness change the pattern of rocking and swaying motions. For legged systems to be maneuverable, they must be able to traverse arbitrary paths in the horizontal plane. GRA

N84-18906# Texas A&M Univ., College Station.
SCIENCE OF INTEGRATION Final Report, 29 Apr. 1982 - 1 Jul. 1983
W. A. Hyman, R. D. Hutchingson, C. Lessard, and B. Das Sep. 1983 25 p
(Contract F33615-78-D-0629; AF Proj. 7930)
(AD-A135590; SAM-TR-83-32) Avail: NTIS HC A02/MF A01 CSCL 05/8

This project identified under the term integration, rules, guidelines, and management processes which, when followed, would result in optimal system performance and the avoidance of certain types of problems which presently exist in aircrew life support equipment. The occurance of burdensome of otherwise problematical equipment is frequently a result of poorly defined design constraints rather than lack of integration. Therefore, lack of integration is not necessarily the cause of equipment problems, nor will integration necessarily alleviate them. Integration, the combining of tasks of system hardware so as to optimize a system design with respect to preselected parameters, requires a detailed specification of the critical parameters and sufficient design a alternatives such that the optimum design can be selected. Both technical and managerial research, development, and implementation control are necessary to (a) properly define subsystem design constraints, (b) identify existing subsystems that can or must be redesigned to accommodate other new subsystems, and (c) test any resultant system for overall compliance with total function and total constraints. GRA

N84-18907# California Univ., San Diego, La Jolla. Inst. for Cognitive Science.
USER CENTERED SYSTEM DESIGN
L. Bannon, E. Conway, A. Cypher, S. Draper, J. Graham, Steven Greenspan, Melissa L. Monty, Donald A. Norman, Claire Omalley, and Robert W. Root Nov. 1983 35 p Presented at the 1983 CHI Conf. on Human Factors in Computer Systems, Boston, Dec. 1983
(Contract N00014-79-C-0323; NR Proj. 667-437)
(AD-A136131; ICS-8305) Avail: NTIS HC A03/MF A01 CSCL 05/5

This report includes four papers by the UCSD Project on Human-Computer Interfaces presented at the 1983 Conference on Human Factors in Computer Systems (Boston, December 1983). The first paper, Evaluation and Analyses of User's Activity Organization (Bannon, Cypher, Greenspan, and Monty), analyzes the activities performed by users of computer systems. The second paper, A Proposal for User Censered System Documentation (O'Malley, Smolensky, Bannon, Conway, Graham, Sokolov, and Monty), outlines a set of proposals for the development of system documentation based on an analysis of user needs. The third paper, Questionnaires as a Software Evaluation Tool (Root and Draper), reports on a study investigating the strengths and weaknesses of questionnaires as software evaluation tools. The fourth paper, Design Principles for Human-Computer Interfaces (Norman), discusses some of the properties that useful principles should have and presents examples of a tradeoff analysis. GRA

N84-18908# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
USN/USAF ANTI-G-SUIT CONSOLIDATION PROGRAM Final Report
J. Z. Lewyckyj 22 Aug. 1983 23 p
(AD-A136138; NADC-83076-60) Avail: NTIS HC A02/MF A01 CSCL 06/17

As a result of a Standardization meeting between the US Air Force and the US Navy, it was decided that a joint specification would be prepared for an Anti-G Suit. To this end, each service would evaluate the other Services Anti-G Suit and the best features would be combined. This report provides some of the background and a comparison of both suits. It provides a test program on the Air Force CSU-13/P Anti-G Suit to be conducted by NAVAIRDEVCEN. Author (GRA)

N84-18462# Centre National d'Etudes Spatiales, Toulouse (France).
ELECTROMAGNETIC DESIGN OF A REMOTE MANIPULATOR ARM FOR SPACE APPLICATIONS [CONCEPTION ELECTROMAGNETIQUE D'UN BRAS TELEMANIPULATEUR POUR APPLICATIONS SPATIALES]
L. Petitjean and J. C. Binder (Crouzet, Valence, France) *In* ESA First European Space Mech. and Tribology Symp. Dec. 1983 p 63-71 In FRENCH (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-18909*# Arizona State Univ., Tempe. Dept. of Computer Science.
INTELLIGENT EDITOR/PRINTER ENHANCEMENTS Final Report
Marvin C. Woodfill and David C. Pheanis 15 Sep. 1983 144 p
(Contract NAS8-34969)
(NASA-CR-170965; NAS 1.26:170965; CR-R-83005) Avail: NTIS

HC A07/MF A01 CSCL 09B

Microprocessor support hardware, software, and cross assemblers relating to the Motorola 6800 and 6809 process systems were developed. Printer controller and intelligent CRT development are discussed. The user's manual, design specifications for the MC6809 version of the intelligent printer controller card, and a 132-character by 64-line intelligent CRT display system using a Motorola 6809 MPU, and a one-line assembler and disassembler are provided. N.W.

N84-18910# Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.

A VERSATILE PARALLEL IMAGE PROCESSOR SYSTEM Final Report, 1 Mar. 1978 - 31 Dec. 1982

H. J. Siegel Oct. 1983 32 p

(Grant AF-AFOSR-3581-78; AF Proj. 2304)

(AD-A136292; AFOSR-83-1231TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

PASM, a large-scale multimicroprocessor system being designed at Purdue University for image processing and pattern recognition, is described. This system can be dynamically reconfigured to operate as one or more independent SIMD and/or MIMD machines. PASM consists of a parallel computation unit, which contains N processors, N memories, and an interconnection network; Q micro controllers, each of which controls N/Q processors; N/Q parallel secondary storage devices; a distributed memory management system; and a system control unit, to coordinate the other system components. Possible values for N and Q are 1024 and 16, respectively. The interconnection network, control schemes, and memory management in PASM are described. Examples of how PASM can be used to perform image processing tasks are given. In addition, there is a list of 53 publications that describe in detail the research that has been supported by this grant. Author (GRA)

N84-18911# Office of Naval Research, London (England).

PROCEEDINGS OF THE 9TH WORLD COMPUTER CONGRESS. IFIP (INTERNATIONAL FEDERATION OF INFORMATION PROCESSING)

J. F. Blackburn 24 Oct. 1983 9 p

(AD-A136317; ONRL-C-17-83) Avail: NTIS HC A02/MF A01 CSCL 09/2

Highlights of the conference included discussions of the design of Ada, the VLSI (Very Large Scale Integration)/ULSI (Ultralarge Scale Integration) chip, logic programming, multiprocessor data bases, high-performance computers, fifth-generation computers, dataflow machines, and high-speed processors. GRA

N84-18912# Stanford Univ., Calif. Computer Systems Lab.

VERIFICATION OF HARDWARE DESIGN CORRECTNESS: SYMBOLIC EXECUTION TECHNIQUES AND CRITERIA FOR CONSISTENCY

W. E. Cory Jun. 1983 118 p

(Contract DAAG29-80-K-0046)

(AD-A136466; SU-TR-83-241) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis investigates two aspects of the functional verification problem in digital hardware design. It discusses the reduction of case splitting in the symbolic execution of event-driven simulations and defines criteria for consistency between two hardware descriptions. Symbolic executions of event-driven simulations tend to split into many subcases due to the event detection mechanism. The substitution of non-selective trace for selective trace eliminates this case splitting for combinational elements. In general, an inductive assertion analysis or a symbolic execution test can determine whether the substitution is correct for a particular element. Case merging using conditional expressions is a more general technique for eliminating case splitting but it tends to generate complex symbolic expressions. Case merging is most likely to be beneficial for functional verification when the simulation relation is sparse and the symbolic expression complexity grows slowly. This thesis defines a criterion that applies to both deterministic and nondeterministic models, with and without don't-cares. Hierarchical verification is demonstrated for the new criterion. This criterion is also modified to facilitate the verification of programs with loops. It is shown to retain intuitive notions of correctness captured by the first criterion. Finally, a modification of the hierarchical design methodology allows the application of Brand's theorem for partitioned verification even when the design introduces new timing details. The introduction of new timing details is performed separately from the introduction of new structural detail. GRA

N84-18913# Michigan Univ., Ann Arbor. Lab. for Supercomputer Algorithm Research.

A CRAY-CLASS MULTIPROCESSOR SIMULATOR

Paul M. Summers and D. A. Orbits 1 Sep. 1983 130 p

(Grant AF-AFOSR-0158-80; AF Proj. 2304)

(AD-A136555; SARL-1; AFOSR-83-1246TR) Avail: NTIS HC A07/MF A01 CSCL 09/2

A logical timing instruction level simulator is described for a hypothetical multiprocessor consisting of CRAY-1's connected to a common memory. It is useful for gaining insight into the design of multiprocessor algorithms and for developing high performance algorithms for CRAY processors with instruction sets similar to the CRAY-1. Author (GRA)

N84-18914# Stanford Univ., Calif. Dept. of Computer Science.

REASONING ABOUT DIGITAL CIRCUITS Ph.D. Thesis

Benjamin Charles Moszkowski Jul. 1983 149 p

(Contract N00039-82-C-0250; Grants AF-AFOSR-0014-81; NSF MCS-79-09495; NSF MCS-81-11586)

(AD-A136634; SU-STAN-CS-83-970) Avail: NTIS HC A07/MF A01 CSCL 09/2

Predicate logic is a powerful and general descriptive formalism with a long history of development. However, since the logic's underlying semantics have no notion of time, statements such as I increases by 2 and The bit signal X rises from 0 to 1 can not be directly expressed. The author presents a formalism called interval temporal logic (ITL) that augments standard predicate logic with time-dependent operators. ITL is like discrete linear-time temporal logic but includes time intervals. The behavior of programs and hardware devices can often be decomposed into successively smaller intervals of activity. State transitions can be characterized by properties relating the initial and final values of variables over intervals. Furthermore, these time periods provide a convenient framework for introducing quantitative timing details. After giving some motivation for reasoning about hardware, he presents the propositional and first-order syntax and semantics of ITL. Demonstrated is ITL's utility for uniformly describing the structure and dynamics of a wide variety of timing-dependent digital circuits. Devices discussed include delay elements, adders, latches, flip-flops, counters, random-access memories, a clocked multiplication circuit and the Am2901 bit slice. ITL also provides a means for expressing properties of such specifications. Also examine are such concepts as device equivalence and internal states. Propositional ITL is shown to be undecidable although useful subsets are of relatively reasonable computational complexity. Author (GRA)

N84-18915# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

A MULTIPROCESSOR EMULATION FACILITY Interim Research Report

Arvind, M. L. Dertouzos, and R. A. Iannucci Sep. 1983 29 p

(Contract N00014-75-C-0661)

(AD-A136094; MIT/LCS/TR-302) Avail: NTIS HC A03/MF A01 CSCL 09/2

Interest in multiprocessor computer architectures has increased dramatically in the last ten years. However, it has become clear that in order to effectively use multiprocessors in a general way, some fundamental changes in the model of computation are necessary. Moreover, experimentation in the field is hindered by low-performance simulation tools and high-cost hardware modeling schemes. We present our approach to solving both of these problems: DATAFLOW ARCHITECTURE, which provides an inherently parallel model of computation, and a MULTIPROCES-

SOR EMULATION FACILITY, which is a general purpose tool for evaluating multiprocessors architectures at low cost. We also discuss our scheme for using the Emulation Facility to validate our claims about dataflow architecture. Author (GRA)

N84-18916# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
ADAPTIVE MACHINES: EXAMPLES OF ARCHITECTURE, MODELING AND EVALUATION Ph.D. Thesis [MACHINES ADAPTIVES: EXEMPLES D'ARCHITECTURE, DE MODELISATION, ET D'EVALUATION]
Jean-Alain Hernandez 23 Jun. 1983 95 p refs In FRENCH
(ENST-E-83009) Avail: NTIS HC A05/MF A01

A multiprocessor design capable of dynamic adaptation to workload (ARCADE) is presented. An adaptive operating systems algorithm is analyzed. An algorithm for managing local adaptation (program level) and global (entire system) for adaptation for ARCADE is outlined. Simulations using a page allocation task give encouraging results, but the cost-benefit advantages of adaptive machines in industrial use are unclear, given the relativy low cost of hardware of traditional systems and the high cost of software needed for adaptive machines. Author (ESA)

N84-18917# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
A COMPARISON OF THE CELLULAR LOGIC IMAGE PROCESSOR (CLIP) 4; DISTRIBUTED ARRAY PROCESSOR (DAP) AND MASSIVELY PARALLEL PROCESSOR (MPP) PROCESSOR-ARRAY IMPLEMENTATIONS
F. A. Gerritsen 3 Nov. 1982 25 p refs Submitted for publication
(NLR-MP-82054-U) Avail: NTIS HC A02/MF A01

Image processing applications of the SIMD processor array are compared. It is shown that, for sufficiently long algorithms, the performance of processor arrays which use column or row parallel I/O overlapped with processing is equivalent to the performance of processor arrays which use image parallel I/O. The relative speed up gained by overlapping I/O and processing in the cases of column or row parallel I/O as a function of algorithm length is shown to be sharply peaked. Author (ESA)

N84-19147# Wisconsin Univ., Madison. Dept. of Computer Sciences.
MULTI-COMPUTER PARALLEL ARRAYS, PIPELINE ARRAYS AND PYRAMIDS
Leonard Uhr *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 74-75 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19157# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
AN APPROACH TO RELIABLE PARALLEL DATA PROCESSING
Gerard G. L. Meyer and Howard L. Weinert *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 139-144 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19160# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
VLSI ARCHITECTURES FOR RECOGNITION OF CONTEXT-FREE LANGUAGES
K. S. Fu, Y. T. Chiang, and K. M. Chu *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 159-161 (For primary document see N84-19138 09-82)
(Grant NSF ECS-80-16580)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19162# Hughes Research Labs., Malibu, Calif.
CONCURRENT VLSI ARCHITECTURES FOR TWO DIMENSIONAL SIGNAL PROCESSING SYSTEMS
J. G. Nash and G. R. Nudd *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 167-173 refs (For primary document see N84-19138 09-82)
(Contract N00014-81-K-0191; Grant NSF ECS-80-16581)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19163# Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
VLSI ARCHITECTURES FOR PATTERN ANALYSIS AND IMAGE DATABASE MANAGEMENT
Kai Hwang *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 174-184 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19165# Codex Corp., Mansfield, Mass.
A COMPARISON OF ARITHMETIC UNITS IN VLSI SIGNAL PROCESSING SYSTEMS
Hassan M. Ahmed *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 197-200 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-18918*# Cincinnati Univ., Ohio. Dept. of Mechanical and Industrial Engineering.
POLYREFERENCE SOFTWARE Interim Report
[1983] 49 p refs
(Contract NAS8-34503)
(NASA-CR-170981; NAS 1.26:170981) Avail: NTIS HC A03/MF A01 CSCL 09B

An advanced algorithm for estimating modal parameters was developed. The technique chosen was the Polyreference complex exponential algorithm developed by Vold, that used frequency response, unit impulse response, or initial condition response data from multiple input locations in a global least squares fashion. The merits of this technique and some of its possible applications are discussed. Author

N84-18919*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
SOFTWARE DEVELOPMENT GUIDELINES
Nicholas Kovalevsky and J. M. Underwood Jan. 1979 48 p
(Contract NAS9-15800)
(NASA-CR-171748; JSC-14710; NAS 1.26:171748; LEC-13182)
Avail: NTIS HC A03/MF A01 CSCL 09B

Analysis, modularization, flowcharting, existing programs and subroutines, compatibility, input and output data, adaptability to checkout, and general-purpose subroutines are summarized. Statement ordering and numbering, specification statements, variable names, arrays, arithemtical expressions and statements, control statements, input/output, and subroutines are outlined. Intermediate results, desk checking, checkout data, dumps, storage maps, diagnostics, and program timing are reviewed. N.W.

N84-18920# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SCIENCE ANALYSIS BY KNOWLEDGE STORED IN ASSOCIATIVE NETWORKS [ANALISE DE CENAS ATRAVES DE CONHECIMENTO ARMAZENADO EM REDES ASSOCIATIVAS]
Paulo Ouvera Simoni and Celso deRennaeSouza Jun. 1983 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Integraded Software and Hardware Seminar, Campinas, 25-29 Jul. 1983
(INPE-2784-PRE/350) Avail: NTIS HC A02/MF A01

An approach, from artificial intelligence, for the problem of

scene analysis by computers, through the use of available knowledge about an application's universe is described. Details are given about a knowledge representation model, the basic elements of which are concepts, that may be arranged according to their parts and particularizations, and related by propositions and decision rules organized as a network. Problems of representation efficiency, of access to the information and of making information inferences for a given application, are discussed. Next, peculiarities of the analysis model, such as the utilization of network information and the consistency analysis of newly generated information, are presented. Author

N84-18921*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRIMER FOR THE TRANSPORTABLE APPLICATIONS EXECUTIVE
Patricia A. Carlson, Carmen Ana Emmanuelli, Elfrieda L. Harris, and Dorothy C. Perkins 6 Jan. 1984 83 p
(NASA-TM-86062; NAS 1.15:86062) Avail: NTIS HC A05/MF A01 CSCL 09B

The Transportable Applications Executive (TAE), an interactive multipurpose executive that provides commonly required functions for scientific analysis systems, is discussed. The concept of an executive is discussed and the various components of TAE are presented. These include on-line help information, the use of menus or commands to access analysis programs, and TAE command procedures. Author

N84-18922# SRI International Corp., Menlo Park, Calif.
OBJ-1, A STUDY IN EXECUTABLE ALGEBRAIC FORMAL SPECIFICATION Progress Report, for FY83
30 Sep. 1983 6 p
(Contract N00014-83-C-0333)
(AD-A136282) Avail: NTIS HC A02/MF A01 CSCL 09/2

Our most significant technical results are discussed under three headings: Implementation; Applications and Examples; and Concepts and Foundations. We believe that we have demonstrated, through an ample collection of published examples, the feasibility and applicability of an ultra high level programming language in which problems are described by writing equations, and are then solved by regarding those equations as rules for reducing expressions to answers. We have explored several issues that are significant to programming in general, including: (1) rapid prototyping; (2) reusability in programming; (3) types and modularity; (4) error handling and recovery; (5) database views and representations; (6) pattern matching; and (7) backtracking. A key to (2), (3) and (4) is the graceful integration of code and specification using a new notion called views. Moreover, we have significantly improved our experimental implementation of OBJ. GRA

N84-18923# Florida State Univ., Tallahassee. Dept. of Mathematics and Computer Science.
FILE SEARCHING PROBLEMS IN LOGIC PROGRAMMING SYSTEMS Final Report, 1 Mar. 1981 - 28 Feb. 1982
Caroline M. Eastman Feb. 1983 39 p
(Grant AF-AFOSR-0110-81; AF Proj. 2304)
(AD-A136522; AFOSR-83-1252TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

During this period, the investigator intended to investigate alternative approaches for improving searching performance in logic programming systems to a level that would be acceptable in a production system by conducting experiments in the LOGLISP system. Due to incompatibilities between the DEC 10 source computer and the CDC CYBER 760 running under NOS, which was available at Florida State University, as well as the differences between the UCI LISP on the DEC 10 and the ALISP available on the CYBER, it was impossible to bring the LOGLISP system to fully operational status and perform the experiments. Author (GRA)

N84-18924# Army Industrial Base Engineering Activity, Rock Island, Ill. Manufacturing Technology Div.
MANUFACTURING METHODS AND TECHNOLOGY, CAM (COMPUTER AIDED MANUFACTURING) RELATED PROJECTS, FY 83-85 Final Report
Thethel N. Locke Oct. 1983 55 p
(AD-A136572) Avail: NTIS HC A04/MF A01 CSCL 13/8

This report provides a summary of the Army's FY 83-85 Manufacturing Methods and Technology Program directed toward computer-aided manufacturing. The following information is provided for 66 projects. Project number, title, projected funding, a statement of the problem and proposed solution, and the technology thrust area into which the project is categorized. Author (GRA)

N84-18925# Harry Diamond Labs., Adelphi, Md. Computing Center.
WRITING TSO (TIME SHARING OPTION) COMMANDS IN FORTRAN
Arthur Hausner Oct. 1983 57 p
(HDL Proj. Y91EY1)
(AD-A136584; HDL-TM-83-20) Avail: NTIS HC A04/MF A01 CSCL 09/2

By having various assembler routines interface facilities not normally available in FORTRAN, TSO (time sharing option) commands are easily written in FORTRAN. Major interface routines written at Harry Diamond Laboratories are described in detail, with some helpful hints for using them. Minor routines, including some written in FORTRAN, are briefly described. Some general useful techniques for writing commands are also presented. Finally, three examples are given to illustrate the techniques: (a) SYSOUT, written to provide a copies keyword for a SYSOUT file, (b) READN, to inhibit printing a user's response to a read(for, say, a password), (c) COMPRESS, for compressing a PDS (partitioned data set) in place. Author (GRA)

N84-18926# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ABSTRACT TYPE ORIENTED DYNAMIC VERTICAL MIGRATION Ph.D. Thesis
E. M. Carter Dec. 1983 195 p
(AD-A135840; AFIT/CI/NR-83-74D) Avail: NTIS HC A09/MF A01 CSCL 09/2

The study of structured programming has shown that through data abstraction, program reliability and maintainability can be improved. At the same time, vertical migration has been shown to be an effective way to improve the performance of programs. Contemporary techniques, however, tend to address the needs of only certain classes of programs and therefore may overlook or even preclude certain optimization opportunities. Dynamic microprogramming can overcome the problem of applicability of a particular vertical migration by allowing the migration to be tailored for each particular application. This research describes a study of a technique known as abstract type oriented dynamic vertical migration. This technique involves determining the needs of a program in differing execution environments and tailoring the architecture of the machine to support those environments individually. GRA

N84-18927# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Automatic Data Processing Center.
USER'S GUIDE: INTERACTIVE GRAPHICS COMPUTER PROGRAM FOR CONTOURING RANDOMLY SPACED DATA Final Report
Fred T. Tracy Oct. 1983 23 p
(AD-A135861; WES-INSTRUCTION-K-83-6) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report documents a computer program for contouring a set of nongridded (X, Y, Z) data points on a storage tube graphics terminal such as the Tektronix 4014 in the time-sharing environment. The program performs the contouring as follows: (a) Determines the polygon (using the data points as vertices) which surrounds the data and forms the convex hull; (b) Constructs a triangular mesh, using the data points as nodes, that falls inside the convex hull; (c) Contours inside each triangle using one of three methods: (1) linear interpolation, (2) spline under tension, and (3) bivariant polynomial. This report also compares the results

of this contouring program with an earlier version which uses a rectangular mesh concept. Some sample problems are also given. Author (GRA)

N84-18928# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN IMAGE PROCESSING LANGUAGE M.S. Thesis - Florida Univ.
R. C. Hood Dec. 1983 93 p
(AD-A135865; AFIT/CI/NR-83-62T) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis introduces a new image processing language (IPL) which is based on the domains and operations required to express common image processing algorithms in a high-level language. IPL is independent of any particular computer architecture. Its implementation on a computer can take advantage of the machine's architecture without affecting the correctness of algorithms written in it. IPL includes picture, mask, region, boundary, and histogram domains. Unary, binary, and fly operations are described for picture, mask, and region domains and several examples of their use are provided through the expression of several common image processing algorithms in IPL. IPL also includes several set and component selection operations. The IPL is implemented in Ada to provide a syntax for its use and a second description of its semantics. The Ada implementation of IPL has not been compiled or tested. Author (GRA)

N84-18929# Mitre Corp., Bedford, Mass.
HEWLETT-PACKARD 7221T PLOTTER USER'S MANUAL Final Report
F. S. Durk Nov. 1983 57 p
(Contract F19628-82-C-0001; AF Proj. 5270)
(AD-A135881; MTR-8941; ESD-TR-83-209) Avail: NTIS HC A04/MF A01 CSCL 09/2

This document is a user manual for the Hewlett-Packard HP7221T plotter. The HP7221T uses a compact binary command language. This manual contains a set of FORTRAN '77 utility subroutines written for a PDP 11/24 which makes it easy to generate plots. Author (GRA)

N84-18930# Kestrel Inst., Palo Alto, Calif.
SYNTHESIS OF EFFICIENT STRUCTURES FOR CONCURRENT COMPUTATION Final Interim Report, 1 Oct. 1982 - 30 Sep. 1983
R. M. King, E. W. Mayr (Stanford Univ.), and C. Green 1 Oct. 1983 22 p
(Contract F49620-82-C-0007; AF Proj. 2304)
(AD-A135892; KES-U-83-6; AFOSR-83-1060TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The object of this research is the development of programming knowledge for the synthesis of concurrent programs. In this final report the authors describe techniques for synthesizing efficient parallel structures from high level specifications of a problem. These structures contain collections of trees interconnected in various ways. They examine an apparently diverse group of problems and show that they all have properties in common that allow these syntheses to be performed using only a few synthesis rules. Some alternative syntheses for some structures. Some of the synthesis paths use transformation rules designed to produce parallel structures containing multidimensional lattices. These lattices are then transformed into structures containing trees in some cases. In other cases the lattice structure is better and is retained. In yet other cases the lattice structure is modified to make a better lattice structure. Author (GRA)

N84-18931# Stanford Univ., Calif. Center for Reliable Computing.
A STATISTICAL STUDY OF HARDWARE RELATED SOFTWARE ERRORS IN MVS Interim Technical Report
R. K. Iyer and P. Velardi Oct. 1983 47 p
(Contract DAAG29-82-K-0105)
(AD-A135726; SU-CRC-TR-83-12; CSL-TN-83-231;
ARO-18690.8-EL) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper describes an analysis of hardware related software errors on the MVS operating system at the Center for Information Technology at Stanford University. The study first examines the software error detection mechanism with particular reference to the detection of software errors related to temporary and permanent hardware problems. About 11 percent of all software errors and over 40 percent of all software failures were found to be hardware related. It is shown that the system is seldom able to diagnose the fact that a software error may be hardware related. Key patterns in the occurrence of hardware related software errors are determined and their effect on system recovery examined. In a HW/SW record, both the hardware and the software errors occur in large clusters and have a significant percentage of lost records associated with them. The system recovery management is less likely to recover from hardware related software errors than software errors in general. It is suggested that the error patterns found in this study could form the basis for the detection and recovery management of hardware related software errors. Author (GRA)

N84-18932# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aero Propulsion Lab.
THE GRAPHIX LIBRARY - A COLLECTION OF INTERACTION GRAPHICS ROUTINES FOR THE TEKTRONIX 4014 Final Report, Jul. 1980 - Jul. 1982
Kervyn D. Mach Oct. 1983 21 p
(AF Proj. 3066)
(AD-A135757; AFWAL-TR-83-2071) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report describes GRAPHIX, a library of computer graphics routines for Tektronix 4014 terminals connected to CDC CYBER or Hewlett-Packard 1000 computers. Offering flexible output and ease of use with small memory overhead, GRAPHIX is an attractive alternative to PLOT-10 for many applications. An application guide is included. Author (GRA)

N84-18933# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
PROGRAM MUTATION: AN APPROACH TO SOFTWARE TESTING Final Report
R. A. DeMillo Apr. 1983 306 p
(Contracts N00014-79-C-0231; DAAG29-80-C-0120)
(AD-A135775; ARO-16943.5-EL-A) Avail: NTIS HC A14/MF A01 CSCL 09/2

Program Mutation is a method of assessing the quality of computer program test data. Test data is said to be adequate if a program behaves correctly on the data but incorrect programs fail. A mutation score assesses how close a given test is to being adequate. This report describes the status of research in program mutation. Topics covered include theoretical results, error classification, experimental studies, implementation strategies for a mutation analyzer, and field studies. Author (GRA)

N84-18934# Yale Univ., New Haven, Conn. Dept. of Computer Science.
THE EXTENSION AND APPLICATION OF GLOBAL COMPACTION TECHNIQUES FOR HORIZONTAL SCIENTIFIC CODE Final Report, 1 Sep. 1981 - 31 Aug. 1983
Joseph A. Fisher 8 Nov. 1983 8 p
(Contract DAAG29-81-K-0171)
(AD-A135794; ARO-18483.5-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report summarizes the work completed in applying trace scheduling to the Floating Point Systems AP164 array processor. This ongoing project focuses upon trace scheduling. The two main aspects of the proejct are the development of a trace scheduling compiler and to design a single instruction multiple data (SIMD) floating point machine that is optimized for trace scheduling. The aspect of this project which has been done under this ARO grant was the development of a trace scheduler for the AP164 attached processor. This architecture is the most common example of a SIMD machine for which the user writes code. The AP164 offers limited parallelism in that it has three alu's and a limited crossbar. GRA

N84-18935# University of Southern California, Marina del Rey. Information Sciences Inst.

ANALYSIS OF RELIABLE MULTICAST ALGORITHMS FOR LOCAL NETWORKS

Paul V. Mockapetris Nov. 1983 15 p Presented at the 8th Data Communications Symp., North Falmouth, Mass., Oct. 1983; sponsored by Assoc. for Computing Mach. Special Interest Group on Data Communications, and IEEE

(Contract MDA903-81-C-0335)

(AD-A135807; AD-E401101; ISI/RS-83-10) Avail: NTIS HC A02/MF A01 CSCL 09/2

Local networks offer unique opportunities for supporting multicast transmissions. This paper describes and analyzes several families of multicast algorithms for local networks. The algorithms examined provide reliable service by dealing with the effects of transmission errors. Author (GRA)

N84-18936# IIT Research Inst., Rome, N.Y.

DATA AND ANALYSIS CENTER FOR SOFTWARE: AN IAC IN TRANSITION Final Technical Report, Sep. 1981 - Dec. 1982

S. A. Gloss-Solar Griffiss AFB, N.Y. RADC Jun. 1983 102 p

(Contract F30602-81-C-0280; AF Proj. 2528)

(AD-A135985; RADC-TR-83-132) Avail: NTIS HC A06/MF A01 CSCL 09/2

The Data & Analysis Center for Software (DACS) was established to serve as a central source for data and information on software technology. The DACS was operated on a pilot basis for a 36-month period, then entered a 15-month transition period. This final report presents a detailed summary of the activities carried out, products produced, and services provided during this transition period. Details are also provided on enhancements to the STINFO databases, the Software Life Cycle Empirical Database (SLED), and the implementation and results of the DACS cost recovery program. A list of users of the DACS during this transition period is provided in an Appendix. Author (GRA)

N84-18937# Maryland Univ., College Park. Dept. of Computer Science.

RESEARCH IN PROGRAMMING LANGUAGES AND SOFTWARE ENGINEERING Final Report, 1 Jan. - 31 Dec. 1982

V. R. Basili, J. D. Gannon, R. G. Hamlet, N. Roussopoulos, and M. D. Weiser 7 Mar. 1983 9 p

(Contract F49620-80-C-0001; AF Proj. 2304)

(AD-A136037; AFOSR-83-1150TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes work in progress in the following topics: Program Metrics; Program Testing - Experimental Investigations, Step-wise Testing, Testing of Concurrent Specifications, and Testing-theory Critique; Theoretical Issues in Software Engineering; Debugging with Slices; PLACES; Programming Environments; Concurrent, Distributed Systems; and Graphical Design and Documentation. The paper also lists other papers and articles arising from this research effort. GRA

N84-18938# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

SIMULATION TOOLS FOR DIGITAL LSI (LARGE SCALE INTEGRATION) DESIGN Ph.D. Thesis

C. J. Terman Sep. 1983 160 p

(Contracts N00014-75-C-0661; N00014-83-K-0125)

(AD-A136116; MIT/LCS/TR-304) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis proposes a timing simulator (RSIM) based on a uniquely simple transistor model. RSIM allows a designer to determine both the functional and approximate timing characteristics of a MOS network with more accuracy than gate-level simulation, and using larger circuits than are accommodated by circuit analysis programs. In RSIM, transistors are modeled as resistors; the logic states of a transistor's terminal modes determine its effective resistance. Using this model, a MOS network is simulated as a network of resistors where each node's value is determined by the resistance of its connections to various inputs. Transition times are determined from the RC time constant calculated for the node by examining the surrounding network; (R from the transistors, C from the interconnect and gate capacitance). The network's behavior as inputs are given values is calculated by an efficient event-driven algorithm. Two changes to the underlying model are also investigated: (1) further simplifying the transistor model to an on/off switch (which can be thought of as a degenerate resistor). Several approaches to switch-level simulation are developed, one particularly well-suited for implementation using parallel hardware; and (2) modeling the behavior of a network of switches by a system of logic equations. Various compilation strategies are evaluated for producing code that implements the system of equations. Author (GRA)

N84-18939# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

PRELIMINARY REPORT ON THE LARCH SHARED LANGUAGE Interim Research Report

J. V. Guttag and J. J. Horning Oct. 1983 59 p

(Contract N00014-75-C-0661; Grant NSF MCS-81-19846)

(AD-A136117; MIT/LCS/TR-307) Avail: NTIS HC A04/MF A01 CSCL 09/2

Each member of the Larch family of formal specification languages has a component derived from a programming language and another component common to all programming languages. The authors call the former interface languages, and the latter the Larch Shared Language. This report presents version 1.0 of the Larch Shared Language. It begins with a brief introduction to the Larch Project and the Larch family of languages. The next chapter presents most of the features of the Larch Shared Language and briefly discusses how we expect these features to be used. It should be read before reading either of the remaining two chapters, which are a self-contained reference manual and a set of examples. Author (GRA)

N84-18940# Pacific Northwest Lab., Richland, Wash.

GEOSTATISTICS SOFTWARE USER'S MANUAL FOR THE GEOSCIENCES RESEARCH AND ENGINEERING DEPARTMENT PDP 11/70 COMPUTER

J. L. Devary, P. J. Mitchell, W. A. Rice, and D. W. Damschen Dec. 1983 57 p refs

(Contract DE-AC06-76RL-01830)

(DE84-004149; PNL-4882) Avail: NTIS HC A04/MF A01

Geostatics and kriging are statistical techniques that can be used to estimate a hydrologic parameter surface from spatially distributed data. The techniques produce statistically optimum estimates of a surface and can aid in pinpointing areas of greatest need for data. This document describes the use of geostatistical software routines that have been implemented at Pacific Northwest Laboratory's (PNL's) PDP 11/70 computer of the Geosciences Research and Engineering Department for use with the Hanford ground water monitoring data ase of the Ground-Water Surveillance Program sponsored by U.S. Department of Energy. The geostatistical routines were modified to improve input/output file efficiency and to accept larger data sets. Two data processing routines were also developed for retrieving and sorting data into a form compatible with the geostatistical routines. 6 references, 9 figures, 1 table. DOE

N84-18941# Argonne National Lab., Ill. Mathematics and Computer Science Div.

SQUEEZING THE MOST OUT OF AN ALGORITHM IN CRAY FORTRAN

Jack J. Dongarra and Stanley C. Eisenstat (Yale Univ.) May 1983 18 p refs

(Contracts W-31-109-eng-38; N00014-82-K-0184; Grant NSF MCS-81-04874)

(DE84-003871; ANL/MCS-TM-9) Avail: NTIS HC A02/MF A01

A technique for achieving supervector performance on a Cray in a purely FORTRAN environment (i.e., without resorting to assembly language) is discussed. The technique can be applied to a wide variety of algorithms in linear algebra, and is beneficial in other architectural settings. DOE

N84-18942# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Uebertragungstechnik und Elektroakoustik.
CIRCUIT BOARD INTERMEDIATE LANGUAGE (CBIL): A DATA BASE FOR CIRCUIT BOARD DESCRIPTION [CBIL: EINE DATENBASIS FUER PLATINEBESCHREIBUNG]
Gerhard Rueckle Mar. 1983 62 p ref In GERMAN
(IND-FB-110) Avail: NTIS HC A04/MF A01

The intermediate language CBIL was developed for computer assisted processing and storage of flat circuit board descriptions. The syntax of CBIL and Circuit Board Design Language (CBDL/2) and improvements with respect to CBDL/1 are presented. Its great flexibility makes CBIL suited for data from off-line systems and for processing via interactive systems. Control and maintenance of software development is simple since the data base of each text editor can be processed. Author (ESA)

N84-18943# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
COMPUTER PROGRAMS FOR CONTINUUM MEASUREMENTS AT THE METSAEHOVI RADIO RESEARCH STATION
Seppo Urpo 1982 45 p refs
(Rept-S-130; ISBN-951-752-571-0) Avail: NTIS HC A03/MF A01

A computer program package for continuum measurements at 12,22 and 37 GHz was developed for the Hewlett-Packard 2100A minicomputer in HP-BASIC. Subprograms include ON-ON and ON-OFF 5-point measurements using synchronous tracking; ON-tracking; scanning, mapping; optical depth measurement; calibration of the receiver gain; data reduction, offset measurements of the telescope. Author (ESA)

N84-18944# General Accounting Office, Washington, D. C. Information Management and Technology Div.
GREATER EMPHASIS ON TESTING NEEDED TO MAKE COMPUTER SOFTWARE MORE RELIABLE AND LESS COSTLY
27 Oct. 1983 65 p
(PB84-113513; GAO/IMTEC-84-2; B-206180) Avail: NTIS HC A04/MF A01 CSCL 09B

This report discusses the adequacy and effectiveness of federal agencies' software testing practices. GAO found that many improvements are needed in (1) the planning for ADP software testing, including defining the testing procedures, criteria, and techniques required before placing either agencyor contractor-developed software into operation; (2) the process by which the agenciws monitor and enforce compliance with testing objectives and strategies; and (3) the ultilization of automated tools and testing techniques. GRA

N84-18945# CRC Systems, Inc., Fairfax, Va.
GUIDE TO SOFTWARE CONVERSION MANAGEMENT Final Report
M. Skall, ed. Washington NBS Oct. 1983 215 p refs
(PB84-118314; NBS-SP-500-105; LC-83-600589) Avail: NTIS HC A10/MF A01 CSCL 09B

This guideline was developed to provide federal ADP managers a better understanding of the entire process of software conversion. Software conversions have life cycles with distinct phases and activities that occur in each phase. Understanding the order or sequence of a conversion and of the associated costs should help managers to plan and execute software conversions efficiently, effectively, and with minimum operations disruption to federal agencies. Although extensive references were consulted in preparing this guideline, the most important sources were interviews conducted at 14 federal agencies that had completed or were involved in software conversion projects. These interviews influenced the structure and organization of this guideline in an attempt to present, in logical order, activities that must be performed to achieve a successful conversion. GRA

N84-18946# National Weather Service, Kansas City, Mo.
PROGRAM ERROR
T. F. Schwein Dec. 1983 19 p
(PB84-128081; NOAA-NWS-CRCP-12; NOAA-83120501) Avail: NTIS HC A02/MF A01 CSCL 09B

ERROR is an AFOS application program that maintains an automated log of AFOS hangs, along with the time down, system configuration and an indication of what might have caused the failure and how busy the system was. ERROR runs on the Eclipse S/230 minicomputer under RDOS. It is written in Data General FORTRAN 4 and requires less than 20 seconds to execute. Error uses RDOS generated system information and therefore is independent of the various AFOS loads. In short, ERROR can be used with WSFO loads, AWSO loads, WSO loads and ARFC loads. In addition, ERROR does not have to be updated when a new AFOS software version is installed. GRA

N84-18947# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION, BURROUGHS B3955, BURROUGHS COBOL, VERSION 6.7 Validation Summary Report
9 Sep. 1983 73 p
(PB84-128446; OSD/FSTC-83/245) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Burroughs Corporation, Burroughs COBOL Version 6.7 running under the MCPVI Version 6.7 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found -if any. These include an overview of the validation which lists all categories of discrpancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrpancies together with the tests which failed. GRA

N84-18948# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HARRIS CORPORATION, HARRIS H800, FORTRAN 77 NON-SAU, VERSION 3.12 Validation Summary Report
7 Nov. 1983 12 p
(PB84-128479; OSD/FSTC-83/298) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris Corporation, FORTRAN 77 NON-SAU, Version 3.12 running under the VOS Version 3.0 provides a consolidated summary of the results obtained from the validated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found -if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-18949# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HARRIS CORPORATION, HARRIS H800, VOS COBOL, VERSION 3.0 Validation Summary Report
3 Nov. 1983 52 p
(PB84-128487; OSD/FSTC-83/295) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris Corporation, Harris COBOL Version 3.0 running under the VOS Version 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrpancies found -if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-18950# Office of Software Development, Falls Church, Va. Federal Software Testing Center.

HARRIS CORPORATION, HARRIS H800, HARRIS COBOL, VERSION 3.0
7 Nov. 1983 19 p
(PB84-128495; OSD/FSTC-83/296) Avail: NTIS HC A02/MF A01 CSCL 09B

This FSTC Technical Report for the Harris Corporation, Harris COBOL Version 3.0 running under the VOX Version 3.0 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Nucleus, Level 2 Table Handling, Level 2 Sequential, Level 2 Indexed I-O., Levels 1 and 2 of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up to several sections showing all the discrepancies found - if any. A companion report Validation Summary Report OSD/FSTC-83/295 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N84-18951# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HARRIS CORPORATION, HARRIS H800, FORTRAN 77 SAU, VERSION 3.12 Validation Summary Report
7 Nov. 1983 12 p
(PB84-128503; OSD/FSTC-83/297) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris Corporation, FORTRAN 77 SAU, Version 3.12 running under the VOS Version 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-18952# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
GUIDANCE ON SOFTWARE MAINTENANCE Final Report
Roger J. Martin and Wilma M. Osborne Dec. 1983 75 p refs (PB84-128951; NBS-SP-500-106; LC-83-600611) Avail: NTIS HC A04/MF A01 CSCL 09B

Issues and problems of software maintenance are addressed and actions and procedures which can help software maintenance organizations meet the growing demands of maintaining existing systems are suggested. A working definition for software maintenance is established. Tools and techniques that may be used to improve the control of software maintenance activities and the productivity of a software maintenance organization are discussed. Emphasis is placed on the need for strong, effective technical management control of the software maintenance process. GRA

N84-19145*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROBLEM-ORIENTED SPECIFICATION OF CONCURRENT ALGORITHMS
Armin B. Cremers (Dortmund Univ.) and Thomas N. Hibbard *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 64-68 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19146# Fairchild Lab. for Artificial Intelligence Research, Palo Alto, Calif.
AN OVERVIEW OF SIGNAL REPRESENTATIONS IN SIGNAL PROCESSING LANGUAGES
Gary E. Kopec *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 69-73 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

N84-19161# Maryland Univ., College Park. Computer Vision Lab.
PARALLEL ALGORITHMS FOR IMAGE ANALYSIS, EXTENDED SUMMARY
Azriel Rosenfeld *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 162-167 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

62 COMPUTER SYSTEMS

Includes computer networks.

N84-18953*# SRI International Corp., Menlo Park, Calif.
DEVELOPMENT AND ANALYSIS OF THE SOFTWARE IMPLEMENTED FAULT-TOLERANCE (SIFT) COMPUTER Final Report
Jack Goldberg, William H. Kautz, P. Michael Melliar-Smith, Milton W. Green, Karl N. Levitt, Richard L. Schwartz, and Charles B. Weinstock Feb. 1984 209 p refs
(Contract NAS1-15428)
(NASA-CR-172146; NAS 1.26:172146) Avail: NTIS HC A10/MF A01 CSCL 09B

SIFT (Software Implemented Fault Tolerance) is an experimental, fault-tolerant computer system designed to meet the extreme reliability requirements for safety-critical functions in advanced aircraft. Errors are masked by performing a majority voting operation over the results of identical computations, and faulty processors are removed from service by reassigning computations to the nonfaulty processors. This scheme has been implemented in a special architecture using a set of standard Bendix BDX930 processors, augmented by a special asynchronous-broadcast communication interface that provides direct, processor to processor communication among all processors. Fault isolation is accomplished in hardware; all other fault-tolerance functions, together with scheduling and synchronization are implemented exclusively by executive system software. The system reliability is predicted by a Markov model. Mathematical consistency of the system software with respect to the reliability model has been partially verified, using recently developed tools for machine-aided proof of program correctness. Author

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-18954# Wisconsin Univ., Madison. Mathematics Research Center.
A HIGH-ORDER TEST FOR OPTIMALITY OF BANG-BANG CONTROLS
Alberto Bressan (Padua Univ.) Nov. 1983 21 p
(Contract DAAG29-80-C-0041)
(AD-A136375; MRC-TSR-2596) Avail: NTIS HC A02/MF A01 CSCL 12/1

The determination of optimal controls is the primary problem in control theory. The most effective tool in this respect is Pontryagin's Maximum Principle, which provides necessary conditions for optimality, thus restricting the search to a small set of candidates among which the optimal control is more easily found. In cases where Pontryagin's test does not yield sufficient information, more refined necessary conditions are known, for example Krener's High-order Maximum Principle. The high-order test discussed in this paper states further necessary conditions for optimality and cna be particularly useful when applied to bang-bang controls, a case often encountered in the applications, where other high-order tests are generally ineffective. Author (GRA)

N84-18955# RAND Corp., Santa Monica, Calif.
STRATEGIES OF COOPERATION IN DISTRIBUTED PROBLEM SOLVING Interim Report

Stephanie Cammarata, David McArthur, and Randall Steeb Oct. 1983 31 p
(Contract MDA903-82-C-0061; ARPA Order 3460)
(AD-A136527; AD-F300360; RAND/N-2031-ARPA) Avail: NTIS HC A03/MF A01 CSCL 06/4

Distributed artificial intelligence is concerned with problem solving that is done by groups of agents. This note describes strategies of cooperation that groups require to solve shared tasks effectively. We discuss such strategies first in a domain independent fashion, and then in the context of a specific group problem solving application: collision avoidance in air traffic control. We begin by contrasting the methodologies, difficulties, and opportunities of distributed and centralized problem solving. From this analysis, we infer a set of requirements on the information gathering and organizational policies of group problem solving agents. We then discuss a set of distributed problem solvers that we have developed in the domain of air traffic control and describe some experimental findings with the cooperative strategies used. In particular, we note large task dependent differences in processing times, communication loads, and system errors between the several cooperative strategies. Author (GRA)

N84-18956# Stanford Univ., Calif. Dept. of Statistics.
WIENER-POISSON CONTROL PROBLEMS
H. Weiner 22 Nov 1983 22 p
(Contract N00014-76-C-0475)
(AD-A135943; SU-TR-338) Avail: NTIS HC A02/MF A01 CSCL 12/1

A one-dimensional Wiener plus independent Poisson control process has integrated, discounted non-quadratic cost function with asymmetric bounds on the non-anticipative control, assumed to be a function the current state. A Bellman equation and maximum principle for partial differential-difference equations may be used to obtain the optimal closed loop control if some assumptions on the asymptotic behavior of certain partial differential-difference equations are met. The finite and infinite integral cases are treated separately. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-18957 Royal Signals and Radar Establishment, Malvern (England).
ZOOMING AND SMOOTHING IMAGES USING CONVOLUTION PROCEDURES
H. M. Lamberton and J. F. Sherlock Aug. 1983 21 p refs
(AD-A135659; RSRE-MEMO-3623; BR89868) Copyright. Avail: Issuing Activity

The theory of convolution techniques for integrating and differentiating digital images and for interpolating between picture points is outlined. A least squares polynomial fitting technique reduces the method to the convolution of an array of samples from the picture with a corresponding array of integers. Integer arrays are calculated for a variety of array sizes and polynomial degree. Computationally the processing is very simple, but the load when processing TV rate data is very large. Author (ESA)

N84-18958*# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
ESTIMATION OF PARAMETERS IN LINEAR STRUCTURAL RELATIONSHIPS: SENSITIVITY TO THE CHOICE OF THE RATIO OF ERROR VARIANCES
Mani Y. Lakshminarayanan and Richard F. Gunst [1984] 24 p refs
(Contract NCC9-9)
(NASA-CR-171756; NAS 1.26:171756) Avail: NTIS HC A02/MF A01 CSCL 12A

Maximum likelihood estimation of parameters in linear structural relationships under normality assumptions requires knowledge of one or more of the model parameters if no replication is available. The most common assumption added to the model definition is that the ratio of the error variances of the response and predictor variates is known. The use of asymptotic formulae for variances and mean squared errors as a function of sample size and the assumed value for the error variance ratio is investigated. Author

N84-18959*# California Univ., Los Angeles. Dept. of Mathematics.
CONVERGENCE OF GENERALIZED MUSCL SCHEMES
Stanley Osher [1983] 35 p refs
(Grants NAG1-270; NSF MCS-82-00788; DAAG29-82-K-0090)
(NASA-CR-173356; NAS 1.26:173356) Avail: NTIS HC A03/MF A01 CSCL 12A

Semi-discrete generalizations of the second order extension of Godunov's scheme, known as the MUSCL scheme, are constructed, starting with any three point "E' scheme. They are used to approximate scalar conservation laws in one space dimension. For convex conservation laws, each member of a wide class is proven to be a convergent approximation to the correct physical solution. Comparison with another class of high resolution convergent schemes is made. Author

N84-18960*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
GP-B ERROR MODELING AND ANALYSIS Annual Report
10 Feb. 1984 59 p refs
(Contract NAS8-34426)
(NASA-CR-170985; NAS 1.26:170985) Avail: NTIS HC A04/MF A01 CSCL 12A

The analysis and modeling for the Gravity Probe B (GP-B) experiment is reported. The finite-wordlength induced errors in Kalman filtering computation were refined. Errors in the crude result were corrected, improved derivation steps are taken, and better justifications are given. The errors associated with the suppression of the 1-noise were analyzed by rolling the spacecraft and then performing a derolling operation by computation. Author

N84-18961*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE MAXIMUM-ENTROPY/AUTOREGRESSIVE MODELING OF TIME SERIES
B. Fong Chao Jan. 1984 18 p refs Submitted for publication
(NASA-TM-86057; NAS 1.15:86057) Avail: NTIS HC A02/MF A01 CSCL 12A

The autoregressive (AR) model of a random process is interpreted in the light of the Prony's relation which relates a complex conjugate pair of poles of the AR process in the z-plane (or the z domain) on the one hand, to the complex frequency of one complex harmonic function in the time domain on the other. Thus the AR model of a time series is one that models the time series as a linear combination of complex harmonic functions, which include pure sinusoids and real exponentials as special cases. An AR model is completely determined by its z-domain pole configuration. The maximum-entropy/autogressive (ME/AR) spectrum, defined on the unit circle of the z-plane (or the frequency domain), is nothing but a convenient, but ambiguous visual representation. It is asserted that the position and shape of a spectral peak is determined by the corresponding complex frequency, and the height of the spectral peak contains little information about the complex amplitude of the complex harmonic functions. Author

N84-18962# National Aerospace Lab., Tokyo (Japan).
DUAL CORELATED RANDOM EXCITATION TECHNIQUE FOR MODAL TESTING
Masaaki Sano, Takashi Kai, and Keiji Komatsu 1983 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-762; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A dual correlated random excitation technique is presented for estimating the modal parameters of symmetric structures. In this procedure, a pure random signal is used to drive each of two identical excitation systems located at symmetric positions of the

structure in order to reduce the number of degree of freedom in a given measurement by separating symmetric and anti-symmetric vibration modes. Experimental results indicate that although the vibration modes are well separated, the resulting eigen frequencies are slightly shifted and the damping ratios are found higher compared to those estimated by the conventional one point random excitation method. Author

N84-18963# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Physics.

A COMPARISON OF OPTICAL VERSUS HARDWARE FOURIER TRANSFORMS Final Report, 1 Jul. - 31 Oct. 1983

S. P. Almeida 31 Oct. 1983 29 p

(Grant AF-AFOSR-0200-83; AF Proj. 2305)

(AD-A136223; AFOSR-83-1077TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A comparison of the optical transform versus the hardware Fourier transform was made for two input functions: a rectangular aperture and a six-pointed star design. The optical transforms were modified using sharp and smooth lowpass as well as highpass filters. The results were compared against those obtained using the array processor hardware at the Brooks Air Force Base, School of Aerospace Medicine. The ringing observed in the lowpass filtered results of the array processor was simulated by the optical methods. However, certain asymmetric in the hardware ringing data were not observed optically. A discussion of the ringing and how to eliminate it is also presented. Author (GRA)

N84-18964# Wisconsin Univ., Madison. Mathematics Research Center.

A SINGULAR PERTURBATION ANALYSIS OF THE FUNDAMENTAL SEMICONDUCTOR DEVICE EQUATIONS

Peter A. Markowich Oct. 1983 60 p

(Contract DAAG29-80-C-0041)

(AD-A136322; MRC-TSR-2585) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper the author presents a singular perturbation analysis of the fundamental semiconductor device equations which form a system of three second order elliptic differential equations subject to mixed Neumann-Dirichlet boundary conditions. The system consists of Poisson's equation and the continuity equations and describes potential and carrier distributions in an arbitrary semiconductor device. The singular perturbation parameter is the minimal Debye-length of the device under consideration. Using matched asymptotic expansions they demonstrate the occurrence of internal layers at surfaces across which the impurity distribution which appears as an inhomogeneity of Poisson's equation has a jump discontinuity (these surfaces are called 'junctions') and the occurrence of boundary layers at semiconductor-oxide interfaces. The author derives the layer-equations and the reduced problem (charge-neutral-approximation) and give existence proofs for these problems. They layer solutions which characterize the solution of the singularly perturbed problem close to junctions and interfaces resp. are shown to decay exponentially away from the junctions and interfaces resp. It is shown that, if the device is in thermal equilibrium, then the solution of the semiconductor problem is close to the sum of the reduced solution and the layer solution assuming that the singular perturbation parameter is small. Numerical results for a two-dimensional diode are presented. Author (GRA)

N84-18965# Wisconsin Univ., Madison. Mathematics Research Center.

INTERVAL METHODS FOR FIXED-POINT PROBLEMS

L. B. Rall Oct. 1983 34 p

(Contract DAAG29-80-C-0041)

(AD-A136323; MRC-TSR-2583) Avail: NTIS HC A03/MF A01 CSCL 12/1

Scientific computation is devoted largely to processes for numerical solution of ordinary and partial differential equations, integral equations, and finite systems of linear and nonlinear equations, all problems which can be formulated abstractly as a fixed-point problem in some suitable space. Since the computation is carried out on a computer, and not in the space in which the problem is posed, methods of discrete approximation are used, and ordinarily detailed analysis is required to estimate the reliability and accuracy of the flood of floating-point numbers produced, as well as their interpretation in terms of the original problem. In this report, it is shown that interval methods can be used to overcome many of the difficulties of this kind which arise in scientific computation. The goal is to have the computation itself provide the required information about the reliability and accuracy of the computed results. It is shown that interval iteration can be used to prove existence or nonexistence of solutions in given regions, and to obtain lower and upper bounds for solutions in those regions. The transition to actual computation consists simply of identification of the floating-point numbers available on a computer with a finite set of elements of the space in question, for example, as step functions with floating-point values, and directed rounding from the space to this finite subspace. GRA

N84-18966# Wisconsin Univ., Madison. Mathematics Research Center.

STRUCTURE AND STABILITY OF FINITE DIMENSIONAL APPROXIMATIONS FOR FUNCTIONAL DIFFERENTIAL EQUATIONS

Dietmar Salamon Oct. 1983 47 p

(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)

(AD-A136324; MRC-TSR-2586) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper deals with the structural and stability properties of the averaging approximation scheme for linear retarded functional differential equations. Both in the discrete- and in the continuous-time case the structure of the approximating systems is shown to be analogous to the structure of the underlying retarded equation. Moreover, it is shown that the approximating systems are exponentially stable in a uniform sense if the original system is asymptotically stable. Author (GRA)

N84-18967# Wisconsin Univ., Madison. Mathematics Research Center.

A SINGULAR FREE BOUNDARY PROBLEM

K. Hollig and John A. Nohel Oct. 1983 17 p

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A136325; MRC-TSR-2582) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Cauchy problem is similar to the well-known one phase Stefan problem (in one space dimension). In the latter one would assume $g(x) = -1$ for $x < 0$, as well as $g(x) > 0$ for $x > 0$, so that g would have a jump discontinuity at $x = 0$. Our assumptions on the initial data g yield a different behavior of the solution v and of the resulting free boundary. Indeed, the free boundary is not (infinitely) differentiable at $t = 0$, contrary to the situation for the classical Stefan problem. This problem also serves as a prototype of nonlinear parabolic problems which arise as monotone convexifications of nonlinear diffusion equations with nonmonotone constitutive functions phi. That analysis shows the existence of infinitely many solutions v of the nonmonotone problem each having v bounded, but oscillating more and more rapidly as t infinity 0(+). Thus each solution v exhibits phase changes. Numerical experiments further suggest the conjecture that the physically correct solution of the nonmonotone problem is the one which for $t > 0$ sufficiently large approaches the unique solution of the appropriately related convexified monotone problem. This paper is another step towards the understanding of this intriguing phenomenon. GRA

N84-18968# Wisconsin Univ., Madison. Mathematics Research Center.

APPLICATIONS OF NATURAL CONSTRAINTS IN CRITICAL POINT THEORY TO PERIODIC SOLUTIONS OF NATURAL HAMILTONIAN SYSTEMS

E. W. C. vanGroesen (Catholic Univ., Nymegen, Netherlands) Nov. 1983 34 p Sponsored in part by Niels Stensen Stichting

(Contract DAAG29-80-C-0041)

(AD-A136348; MRC-TSR-2593) Avail: NTIS HC A03/MF A01

CSCL 12/1

This paper deals with periodic solutions of Hamiltonian systems of the form -x = V'(x) with V a given function. Assuming V to be either a convex or an even function, and prescribing the period, existence results are obtained for the number of solutions in relation to the minimal period of these solutions, assuming superquadratic growth at infinity only, or subquadratic growth at infinity together with specific behavior at the origin for V. By introducing natural constraints, these results are obtained by applying variational methods directly to the action functional. Author (GRA)

N84-18969# Wisconsin Univ., Madison. Mathematics Research Center.

FINITE DIFFERENCE METHODS FOR THE INCOMPRESSIBLE NAVIER-STOKES EQUATIONS: A SURVEY

J. C. Strikwerda Oct. 1983 22 p

(Contract DAAG29-80-C-0041)

(AD-A136353; MRC-TSR-2584) Avail: NTIS HC A02/MF A01 CSCL 12/1

The incompressible Navier-Stokes equations describe the flow of fluids such as water, air at low speeds, and many other common liquids and gases. Efficient and accurate numerical methods for their solution are therefore of great importance for a wide variety of engineering and scientific applications. In this paper, several existing finite difference methods are examined and suggestions for further research are given. Author (GRA)

N84-18970# Wisconsin Univ., Madison. Mathematics Research Center.

GLOBAL EXISTENCE AND ASYMPTOTICS IN ONE-DIMENSIONAL NONLINEAR VISCOELASTICITY

W. J. Hrusa and J. A. Nohel Nov. 1983 33 p

(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)

(AD-A136367; MRC-TSR-2598) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper we survey recent results concerning global existence and decay of smooth solutions of certain quasilinear hyperbolic Volterra equations which provide models for the motion of one-dimensional viscoelastic solid of the Boltzmann type. We also sketch the derivation of these equations from physical principles, discuss the physically appropriate assumptions, and prove a special case of a new existence theorem for the Cauchy problem. Author (GRA)

N84-18971# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.

ANALYSIS OF AN ERROR MASKING SCHEME FOR PARALLEL COMPUTATIONS

Gerard G. L. Meyer and Howard L. Weinert Dec. 1983 24 p

(Contract N00014-81-K-0813)

(AD-A136372; JHU/EECS-83/19) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors determine the conditions under which an error masking scheme based on strict redundancy can be used to increase our confidence in the results of parallel computations. This study shows that the issues of speed and reliability of parallel processors are interdependent and must be considered jointly at the design stage. Author (GRA)

N84-18972# Wisconsin Univ., Madison. Mathematics Research Center.

USING INTERVAL METHODS FOR THE NUMERICAL SOLUTION OF ODE'S (ORDINARY DIFFERENTIAL EQUATIONS)

Karl L. E. Nickel Nov. 1983 34 p

(Contract DAAG29-80-C-0041)

(AD-A136373; MRC-TSR-2590) Avail: NTIS HC A03/MF A01 CSCL 12/1

This is a survey article which deals with the advantages of using interval methods for the numerical solution of initial value problems for ordinary differential equations. Author (GRA)

N84-18973# Stanford Univ., Calif. Dept. of Statistics.

ON THE FATOU INEQUALITY

A. Dvoretzky Oct. 1983 29 p

(Contract N00014-77-C-0306)

(AD-A136383; TR-23) Avail: NTIS HC A03/MF A01 CSCL 12/1

The classical Fatou inequality for nonnegative measurable functions is intimately connected with problems of convergence of random variables (r.v.). The present paper focuses on the study of a modified form of the Fatou inequality which has important applications in the theory of convergence of r.v. We formulate our results in the language of probability. GRA

N84-18974# Stanford Univ., Calif. Dept. of Statistics.

CORRECTED DIFFUSION APPROXIMATIONS AND THEIR APPLICATIONS

D. Siegmund Dec. 1983 26 p

(Contract N00014-77-C-0306; Grant NSF MCS-80-24649)

(AD-A136384; TR-24) Avail: NTIS HC A03/MF A01 CSCL 12/1

The current state of development of corrected diffusion approximations for first passage times to linear boundaries is reviewed. Some new results and several applications are described. Corrected diffusion approximations and large deviation approximations to the power function of a repeated significance test for a normal mean (known variance) are compared and contrasted. Author (GRA)

N84-18975# Wisconsin Univ., Madison. Mathematics Research Center.

SIMPLIFIED CONFIDENCE INTERVALS FOR AN AWKWARD NONLINEAR MODEL

M. L. Goldberg, P. Bloomfield, and M. F. Fels Nov. 1983 34 p

(Contract DAAG29-80-C-0041; Grant NSF MCS-79-27062)

(AD-A136403; AD-E000556; MRC-TSR-2601) Avail: NTIS HC A03/MF A01 CSCL 12/1

A simple method is developed for approximating confidence intervals for a linear change-point model representing residential energy consumption. The method can be applied to any nonlinear model which is conditionally linear in all but one parameter. The approximation is shown to be more accurate than the Gaussian approximation, and easier to compute than confidence intervals defined by likelihood (sum-of-squares) regions. Computations are described in some detail for the motivating model. Author (GRA)

N84-18976# Wisconsin Univ., Madison. Mathematics Research Center.

APPLICATIONS OF NATURAL CONSTRAINTS IN CRITICAL POINT THEORY TO BOUNDARY VALUE PROBLEMS ON DOMAINS WITH ROTATION SYMMETRY

E. W. C. VanGroesen Nov. 1983 27 p

(Contract DAAG29-80-C-0041)

(AD-A136404; AD-E000556; MRC-TSR-2594) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper a nonlinear Dirichlet problem for the Laplace operator is considered on a disc in R sub 2. It is shown that if the nonlinearity, which may explicitly depend on the radial variable, is odd and superlinear at infinity, there exist infinitely many non-radial solutions. If the nonlinearity is odd and sublinear at infinity, and satisfies certain conditions at zero, a finite number of radial and non-radial solutions will be found. This number is given by the number of radial, respectively non-radial, eigenvalues that are crossed by the nonlinearity. In any case, as a consequence of the oddness of the nonlinearity, these solutions inherit the nodal line structure of the eigenfunctions corresponding to the eigenvalues that are crossed. The results are obtained by using natural constraints in a variational approach of the problem. Author (GRA)

N84-18977# Wisconsin Univ., Madison. Mathematics Research Center.

LINEAR COMPLEMENTARITY PROBLEMS SOLVABLE BY AN EFFICIENT POLYNOMIALLY BOUNDED PIVOTING ALGORITHM

J. Pang Nov. 1983 32 p

(Contract DAAG29-80-C-0041)
(AD-A136405; AD-E000556; MRC-TSR-2597) Avail: NTIS HC A03/MF A01 CSCL 12/1

Applied to two important classes of linear complementarity problems defined by an n x n matrix, the parametric principal pivoting algorithm, using a suitably chosen (and easily computable) parametric vector, terminates with a desired solution after at most n pivot operations. Since each pivot can be performed using at most 0(sq n) arithmetic operations, the total computational complexity of the algorithm for solving these linear complementarity problems is no more than 0(cu m). In one of the two classes of problems being studied, the complexity is 0(sq n) because the matrix involved is 5-diagonal which allows each pivot to be performed in linear time. Some discussion in connection with Lemke's well-known almost complementary pivoting algorithm is also addressed. GRA

N84-18978# Georgia Inst. of Tech., Atlanta. School of Mathematics.
COMPUTATIONAL SOLUTION OF RANDOM EQUATIONS Final Report, 1 Sep. 1981 - 30 Sep. 1983
A. T. Bharucha-Reid 30 Nov. 1983 8 p
(Contract DAAG29-81-K-0174)
(AD-A136418; ARO-18328.5-MA; FR-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research project was concerned with the systematic development of computational methods for random equations. An earlier ARO research project was concerned primarily with the development of computational methods for the solution of random integral equations. This project was concerned with the computational solution of random integral equations as well as other classes of random equations, with special reference to computer implementation of general methods for obtaining approximate solution of other classes of random equations. In particular, we were concerned with computer implementation of (1) approximate methods for solving random linear algebraic systems of equations, (2) projection methods for solving random operator equations, and (3) iterative methods for solving random operator equations. GRA

N84-18979# Stanford Univ., Calif. Systems Optimization Lab.
ON THE REPRESENTATION OF A BASIS FOR THE NULL SPACE
P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright Nov. 1983 10 p
(Contracts N00014-75-C-0267; DAAG29-81-K-0156)
(AD-A136419; SU-SOL-83-19; ARO-18424.13-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Given a rectangular matrix A(x) that depends on the independent variables x, many constrained optimization methods involve computations with Z8x), a matrix whose columns form a basis for the null space of A(x). When A is evaluated at a given point, it is well known that a Coleman and Sorensen have recently shown that standard orthogonal factorization methods may produce orthogonal bases that do not vary continuously with x; they also suggest several techniques for adapting standard factorization schemes so as to ensure continuity of Z in the neighborhood of a given point. In this note, the authors discuss several aspects of the representation of a basis for the null space. They describe how an explicit matrix Z can be obtained at any point using a method for updating a factorization with either Householder or stabilized elementary transformations. Under a mild non-singularity assumption, the elements of Z are continuous functions of x. They also show that the chosen form of Z is convenient and efficient when implementing certain methods for nonlinearly constrained optimization. Author (GRA)

N84-18980# Wisconsin Univ., Madison. Mathematics Research Center.
INITIAL VALUE PROBLEMS FOR VISCOELASTIC LIQUIDS
M. Renardy Nov. 1983 19 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A136425; MRC-TSR-2589) Avail: NTIS HC A02/MF A01 CSCL 12/1

Cauchy problems for equations modelling non-Newtonian fluids are discussed and recent existence theorems for classical solutions, based on semigroup methods, are presented. Such existence results depend in a crucial manner on the symbol of the leading differential operator. Both parabolic and hyperbolic cases are discussed. In general, however, the leading differential operator may be of non-integral order, arising from convolution with a singular kernel. This has interesting implications concerning the propagation of singularities. In particular, there are cases where C infinity-smoothing coexists with finite wave speeds.
Author (GRA)

N84-18981# Wisconsin Univ., Madison. Mathematics Research Center.
NUMERICAL METHODS FOR STIFF TWO-POINT BOUNDARY VALUE PROBLEMS
H. Kreiss, N. K. Nichols, and D. L. Brown Nov. 1983 86 p
(Contracts N00014-83-K-0422; DAAG29-80-C-0041; Grant AF-AFOSR-0321-82)
(AD-A136427; MRC-TSR-2599) Avail: NTIS HC A05/MF A01 CSCL 12/1

The authors consider the two-point boundary value problem for stiff systems of ordinary differential equations. For systems that can be transformed to essentially diagonally dominant form with appropriate smoothness conditions, a priori estimates are obtained. Problems with turning points can be treated with this theory, and we discuss this in detail. They give robust difference approximations and present error estimates for these schemes. In particular they give a detailed description of how to transform a general system to essentially diagonally dominant form and then stretch the independent variable so that the system will satisfy the correct smoothness conditions. Numerical examples are presented for both linear and nonlinear problems. Author (GRA)

N84-18982# Utah Univ., Salt Lake City. Dept. of Mathematics.
AN ADAPTIVE, NOISE TOLERANT, FREQUENCY EXTRAPOLATION ALGORITHM FOR DIFFRACTION CORRECTED ULTRASOUND TOMOGRAPHY
F. Stenger, M. J. Berggren, S. A. Johnson, and Y. Li Dec. 1983 8 p
(Contracts DAAG29-83-K-0012; PHS-5-R01-CA29728-02)
(AD-A136455; ARO-19297.5-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the authors previous work (1), a procedure was developed, based on algorithm for rational function frequency extrapolation and l sub 1 -norm averaging to circumvent both the effects of noise, and errors due to refracted curved paths, for solving the inverse scattering problem in ultrasonic imaging. In this paper, they reverse the order of the first two algorithms with respect to (1;) that is they first apply the l sub 1 averaging procedure and then carry out the rational function procedure, extrapolating to infinite frequency. An adaptive method for choosing the best rational function expansion is also employed. They describe the underlying ideas of the procedure, and illustrate examples of reconstructions in the presence and absence of Gaussian noise. These results are then compared with results of previous experiments. The resulting procedure works with a much smaller signal-to-noise ratio. An extension is suggested to image speed of sound and density. Author (GRA)

N84-18983# Northwestern Univ., Evanston, Ill.
PROCEEDINGS OF THE 13TH INTERNATIONAL SYMPOSIUM ON MULTIPLE-VALUED LOGIC Final Report
J. T. Butler May 1983 431 p Symp. held at Kyoto, 23-25 May 1983
(Grant AF-AFOSR-0018-83; AF Proj. 2305)
(AD-A136457; AFOSR-83-0836TR) Avail: NTIS HC A19/MF A01 CSCL 12/1

The 1983 International Symposium on Multiple-Valued Logic is the thirteenth meeting in a series of annual symposia devoted exclusively to multiple-valued logic. Ten of the past meetings were held in North America, the other two in Europe. The ISMVL-83 in Kyoto, Japan, is the first symposium to be held in Asia. It is

dedicated to the investigation of multiple-valued logic to narrow the gap between theory and practice. Because there are many researchers in Japan and neighboring countries, this symposium offers a unique opportunity for a large number of multiple-valued logic researchers to meet. An Asian conference will encourage the technological development of mainland China, where there are 3000 mathematicians engaged in the study of fuzzy logic. In addition to many speakers, from Japan, we have several newcomers from Thailand, China, and Nigeria. GRA

N84-18984# Desmatics, Inc., State College, Pa.
A COMPARISON OF RANDOM BALANCE AND TWO-STAGE GROUP SCREENING DESIGNS, PART 1
C. A. Mauro Dec. 1983 25 p
(Contract N00014-79-C-0650)
(AD-A136487; TR-113-12-Pt-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report is the first of two reports which compare the efficacy and relative merits of a two-stage group screening strategy versus a random balance screening strategy. These techniques for factor screening have potential application in the study of large-scale computerized simulation models. Author (GRA)

N84-18985# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
THE NONLINEAR FILTERING PROBLEM FOR THE UNBOUNDED CASE
G. Kallianpur and R. L. Karandikar Jun. 1983 15 p
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A136501; TR-33; AFOSR-83-1271TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The finitely additive nonlinear filtering problem for the model y sub t = h sub t (X sub t) + e sub t is solved when the function h is unbounded and satisfies no growth conditions whatever. Author (GRA)

N84-18986# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
INFINITE DIMENSIONAL STOCHASTIC DIFFERENTIAL EQUATION MODELS FOR SPATIALLY DISTRIBUTED NEURONS
G. Kallianpur and R. Wolpert May 1983 65 p
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A136507; TR-31; AFOSR-83-1260TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The membrane potential of spatially distributed neurons is modelled as a random field driven by a generalized Poisson process. Approximation to an Ornstein-Uhlenbeck type process is established in the sense of weak convergence of the induced measures in Skorokhod space. Author (GRA)

N84-18987# California Univ., Los Angeles. Dept. of System Science.
[RESEARCH ON BOUNDARY FEEDBACK AND CONTROL THEORIES, 1978 - 1983] Final Report, 2 Jan. 1982 - 31 Mar. 1983
A. V. Balakrishnan Mar. 1983 16 p
(Grant AF-AFOSR-3550-78; AF Proj. 2304)
(AD-A136531; AFOSR-83-1240TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period of this grant, topics investigated included: nonlinear white noise theory; stabilization of distributed parameter systems by boundary feedback; system modeling and identification; control of flexible flight vehicles; random fields, filtering and estimation; control of randomly varying systems; and control of large space structures. Thirty technical papers were produced with titles including: active control of airfoils in unsteady aerodynamics; identification of aircraft parameters in turbulence with nonrational spectra; Aircraft performance modelling, theory and some preliminary results; and active control of large flexible space structures. GRA

N84-18988# Messina Univ. (Italy). Ist. di Struttura della Materia.
THE ELEMENTS OF THE ROTATION MATRICES IN TERMS OF RODRIGUEZ'S PARAMETERS
F. Borghese, P. Denti, R. Saija, G. Toscano, and O. I. Sindoni Aberdeen Proving Ground, Md. Army Armament Research and Development Command Jun. 1983 17 p Sponsored in part by CNR and Gruppo Nazionale Strutture della Materia
(Contract DAJA37-81-C-0895)
(AD-A136550; ARCSL-TR-83043) Avail: NTIS HC A02/MF A01 CSCL 12/1

The elements of the rotation matrices, for arbitrary-L, as well as those of the matrix S which rotates the cartesian coordinates, are expressed in terms of Rodriguez's parameters, viz., the direction cosines of the axis, lambda, mu, epsilon, and the angle of rotation, omega. Author (GRA)

N84-18989# California Univ., San Diego, La Jolla. Dept. of Electrical Engineering and Computer Sciences.
CALCULATION OF CUMULATIVE DISTRIBUTIONS AND DETECTION PROBABILITIES IN COMMUNICATIONS AND OPTICS Annual Report, 10 Jan. 1982 - 30 Sep. 1983
Carl W. Helstrom 17 Oct. 1983 42 p
(Grant AF-AFOSR-0343-82; AF Proj. 2304)
(AD-A136561; AFOSR-83-1237TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Methods were investigated for evaluating cumulative distributions of continuous random variables of known moment-generating function by numerical quadrature of a contour integral in the complex plane whose integrand involves that function. Applications so far treated were to the detection of radar signals, both fading and unfading, in receivers with constant threshold or with a variable threshold determined by a measurement of the ambient noise (constant-false-alarm-rate receivers), and to the distribution of the average power of a Gaussian random process. Similar methods were studied for finding the cumulative distributions of positive-integral valued random variables by a numerical contour integration involving their probability generating functions, with application to evaluating the distribution of the number of electrons at the output of a photomultiplier. Author (GRA)

N84-18990# Maryland Univ., College Park. Dept. of Computer Science.
DEVELOPMENT OF REALISTIC ALGORITHMS FOR MATRIX COMPUTATIONS ON PARALLEL COMPUTERS Interim Report, 1 Jan. 1982 - 15 Mar. 1983
D. P. OLeary and G. W. Stewart 15 Mar. 1983 7 p
(Grant AF-AFOSR-0078-82; AF Proj. 2304)
(AD-A136570; AFOSR-83-1243TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This is a summary of work accomplished under the grant. The purpose of this effort is to develop realistic algorithms for matrix computations on parallel computers. The research is proceeding in three stages. First, decide on a suitable way of connecting and synchronizing processors for parallel matrix computations. Second, design and build a communications system to realize this network on the ZMOB. Third, code matrix algorithms for the system, and experiment with them. In addition, the investigators must install and test the floating-point processors which were requested as part of the initial grant period. Author (GRA)

N84-18991# Cornell Univ., Ithaca, N.Y. Center for Applied Mathematics.
PROCEEDINGS OF THE 12TH CONFERENCE ON STOCHASTIC PROCESSES AND THEIR APPLICATIONS, ITHACA, N.Y., 11-15 JUL. 1983
15 Jul. 1983 122 p Sponsored in part by NSF, AFOSR and ARO
(AD-A136626) Avail: NTIS HC A06/MF A01 CSCL 12/1

Various topics in the analysis and application of stochastic processes are discussed including: measures with given marginals; reflecting Brownian motion; extensions and invariant measures; Dyson's hierarchial model; one dimensional stochastic Ising models; Markov decision processes; prophet problems; numerical methods; stationary queues; ergodicity and percolation; thinning of point

processes; quantum diffusion; Schrodinger equations; random fractiles; representation of Hunt processes; fiber matrix composite materials; random fields; branching processes; time series; stochastic models; stable processes; reliability; stochastic control and optimal stopping; Markov processes; statistical inference from stochastic processes; stochastic integration; self similar processes; queueing theory; Markov and renewal processes; random fields; renewal theory and random walks; characterization and limit theorems; mixing conditions and limit theorems; and diffusion processes. M.G.

N84-18992# University of Western Michigan, Kalamazoo. Dept. of Mathematics.
RESEARCH ON NONPARAMETRIC METHODS FOR LINEAR MODELS Final Report, 1978 - 1983
G. L. Sievers Nov. 1983 12 p
(Contract N00014-78-C-0637)
(AD-A135850; TR-73) Avail: NTIS HC A02/MF A01 CSCL 12/1

The goal of this project was to conduct research in the development of nonparametric statistical methods based on rank statistics for the general linear model. Consideration was to be given to the use of a comprehensive framework to handle estimation, confidence regions and tests of hypotheses for a wide range of multiple regression and analysis of variance problems. Methods were sought which would be efficient and convenient to use in practice. The practical aspects of implementation for applied problems requires special attention in order that the methodology be direct in interpretation and computationally feasible. GRA

N84-18993# Messina Univ. (Italy).
THE OPTICAL SPECTRA OF AEROSOLS Interim Periodic Report, Mar. - Oct. 1983
F. Borghese Oct. 1983 40 p
(Contract DAJA37-81-C-0895; DA Proj. 1T1-61102-BH-57)
(AD-A135687; IPR-195) Avail: NTIS HC A03/MF A01 CSCL 12/1

A method to calculate the macroscopic optical constants of a low density medium consisting of a cloud of identical nonspherical scatterers is presented. The scatterers in the medium are clusters of dielectric spheres and the electromagnetic field scattered by each of the clusters is obtained as a superposition of multipole fields, as previously proposed by the authors. The transformation properties of the spherical multipoles under rotation allow the orientational-dependent terms in the expression for the forward-scattering amplitude of each of the clusters to be factored out. In this way the sum of the scattering amplitudes of the clusters with different orientations, needed to calculate the optical response of the medium, is greatly facilitated and admits a simple analytic expression in the case of randomly oriented clusters. Results of calculations of the optical constants for a few model media are presented. GRA

N84-18994# University of Western Michigan, Kalamazoo. Dept. of Mathematics.
ON THE ROBUST RANK ANALYSIS OF LINEAR MODELS WITH NONSYMETRIC ERROR DISTRIBUTIONS
Gerald L. Sievers and Joseph W. McKean Sep. 1983 34 p
(Contract N00014-78-C-0637; NR Proj. 042-407)
(AD-A135792; TR-70) Avail: NTIS HC A03/MF A01 CSCL 12/1

The robust analysis of linear models based on R-estimates involves an estimate of a scale parameter which is used in the analysis as a standardizing constant. The consistency of previous estimates of this scale parameter required that the underlying errors be symmetrically distributed. This assumption is not always warranted, for instance in survival models. A new estimate is proposed for the scale parameter and it is shown to be consistent for nonsymmetric and symmetric error distributions. With this new scale estimate, a complete robust analysis of a linear model can be accomplished without assuming symmetry. The small sample properties of the analysis are examined in a Monte Carlo study of several different situations. GRA

N84-18995# Mission Research Corp., Albuquerque, N. Mex.
TOROIDAL SELF-FIELD CORRECTIONS TO THE LINEAR DISPERSION RELATION FOR THE NEGATIVE MASS INSTABILITY IN A MODIFIED BETATRON
B. B. Godfrey, T. P. Hughes, and M. M. Campbell Nov. 1983 17 p Presented at APS Plasma Phys. Meeting, Los Angeles, 7-11 Nov. 1983
(Contract N00014-81-C-0647)
(AD-A135940; AMRC-N-249) Avail: NTIS HC A02/MF A01 CSCL 12/1

Negative mass instability growth rates determined from three-dimensional pic code simulations of high current modified betatrons do not agree particularly well with available linear theory, as noted in a companion paper. Published linear analyses of the negative mass instability treat particle dynamics in toroidal geometry but not the electromagnetic fields in cylindrical geometry. The authors have, therefore, developed a new model employing toroidal fields; it is valid or arbritary toroidal mode numbers and a variety of accelerator cavity minor cross sections. The beam minor radius is assumed small compared to that of the cavity. Derivation of the dispersion relation and numerical solutions of it will be presented. Author (GRA)

N84-18996# Mindlin (Raymond D.), Grantham, N.H.
VIBRATIONS OF DOUBLY-ROTATED-CUT QUARTZ PLATES WITH MONOCLINIC SYMMETRY
R. D. Mindlin 30 Nov. 1983 27 p
(Contract N00014-80-C-0559)
(AD-A135948; RDM/TR-83/2; TR-3) Avail: NTIS HC A03/MF A01 CSCL 12/1

For certain doubly rotated cuts of quartz, the elastic stiffness constants have the same symmetry and absolute values as those for certain rotated-Y-cuts; but four of the thirteen constants have signs reversed. Mathematical solutions of corresponding probelms for the two types of cut have the same form but the numerical results may be the same or different according as the constants with changed signs enter the solution as even or odd powers or products. Examples of both are exhibited. Author (GRA)

N84-18997*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
OPTIMALLY ROBUST REDUNDANCY RELATIONS FOR FAILURE DETECTION IN UNCERTAIN SYSTEMS
Xi-Cheng Lou, Alan S. Willsky, and George C. Verghese Apr. 1983 44 p
(Grant NGL-22-009-124; Contract N00014-77-C-0224)
(NASA-CR-173166; NAS 1.26:173166; AD-A135949; LIDS-P-1297) Avail: NTIS HC A03/MF A01 CSCL 12A

All failure detection methods are based, either explictly or implicitly on the use of redundancy, that is on (possibly dynamic) relations among the measured variables. Consequently the robustness of the failure detection process depends to a great degree on the reliability of the redundancy relations given the inevitable presence of model uncertainties. In this paper the authors address the problem of determining redundancy relations which are optimally robust in a sense which includes the major issues of importance in practical failure detection and which provides them with a significant amount of intuition concerning the geometry of robust failure detection. In addition, they provide a procedure involving the construction of a single matrix and the computation of its singular value decomposition, for the determination of a complete sequence of redundancy relations ordered in terms of their level of robustness. This procedure also provides the basis for comparing robust levels of redundancy provided by different sets of sensors. Author (GRA)

N84-18998# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
COMPARING PROBABILITY FORECASTERS: BASIC BINARY CONCEPTS AND MULTIVARIATE EXTENSIONS
M. H. DeGroot and S. E. Fienberg Sep. 1983 24 p
(Contract N00014-80-C-0637; Grant NSF SES-82-07295)
(AD-A135966; TR-306) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the applied forecasting literature much attention has been lavished on questions about the evaluation of probability forecasts, and the subjectivist view of probability has been invoked to aggregate probability forecasts over a diverse set of events or statements. One criterion invoked in such evaluations is that of calibration: a set of statements or events is considered and we ask if x percent of those assigned probability x of being correct prove to be correct, for each value of x. From this perspective, weather forecasters generally have been found to perform well. What is especially helpful in the evaluation of such probability forecasters is that they make forecasts about a long sequence of events (e.g. rain on a given day), and thus it makes sense to think about probability functions associated with the forecasts. In this paper we focus on a criterion for comparing forecasters, refinement, which goes beyond that of calibration. GRA

N84-18999# Brown Univ., Providence, R. I. Lefschetz Center for Dynamical Systems.
ORBIT CONNECTIONS IN A PARABOLIC EQUATION
J. K. Hale and A. S. DO Nascimento Apr. 1983 18 p
(Contract DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-82-05355; AF Proj. 2304)
(AD-A135986; LCDS-83-9; AFOSR-83-1147TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For all solutions of a particular scalar parabolic equation in one bounded space dimension, the authors discuss the global dynamics on the maximal compact invariant set and especially the orbits connecting equilibrium points. GRA

N84-19000# Maryland Univ., College Park. Inst. for Physical Science and Technology.
FEEDBACK AND ADAPTIVE FINITE ELEMENT SOLUTION OF ONE-DIMENSIONAL BOUNDARY VALUE PROBLEMS Final Report
I. Babuska and M. Vogelius Oct. 1983 58 p
(Contract N00014-77-C-0623)
(AD-A136018; BN-1006) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper examines the concepts of feedback and adaptivity for the Finite Element Method. The model problem concerns C sub 0 elements of arbitrary, fixed degree for a one-dimensional two-point boundary value problem. Three different feedback methods are introduced and a detailed analysis of their adaptivity is given. Author (GRA)

N84-19001# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
FINITE ELEMENT GRID OPTIMIZATION M.S. Thesis
Jesse Blair Schrum Sep. 1983 107 p
(AD-A136025) Avail: NTIS HC A06/MF A01 CSCL 12/1

Since widespread use of the finite element method began in the early 1960's, much effort has been devoted to the development of the method itself, while only recently has there been any research directed at minimizing the discretization error by a proper selection of the element grid. This paper examines some recently proposed grid optimization techniques and applies them to some one- and two-dimensional linear self-adjoint boundary value problems. Guidelines requiring minimal software modification are recommended to assist the analyst in obtaining improved finite element solutions. Author (GRA)

N84-19002# Naval Research Lab., Washington, D. C.
ANOMALOUS TRANSPORT IN CURRENT SHEETS
J. D. Huba 25 Nov. 1983 27 p
(RR0-3302)
(AD-A136030; NRL-MR-5220) Avail: NTIS HC A03/MF A01 CSCL 12/1

A review of several microinstabilities have been suggested as possible anomalous transport mechanisms in current sheets is presented. The specific application is to a field reversed plasma which is relevant to the so-called diffusion region of a reconnection process. The linear and nonlinear properties of the modes are discussed, and each mode is assessed as to its importance in reconnection processes based upon these properties. It is concluded that the two most relevant instabilities are the ion acoustic instability and the lower-hybrid-drift instability. However, each instability has limitations as far as reconnection is concerned, and more research is needed in this area. Author (GRA)

N84-19003# Massachusetts Inst. of Tech., Cambridge.
A FRAMEWORK FOR SOLVING VLSI (VERY LARGE SCALE INTEGRATION) GRAPH LAYOUT PROBLEMS Interim Research Report
S. N. Bhatt and F. T. Leighton Sep. 1983 47 p
(Contract N00014-80-C-0622; Grant AF-AFOSR-0326-82)
(AD-A136143; MIT/LCS/TR-305) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper introduces a new divide- and conquer framework for VLSI graph layout. Universally close upper and lower bounds are obtained for important cost functions such as layout area and propagation delay. The framework is also effectively used to design regular and configurable layouts, to assemble large networks of processors using restructurable chips, and to configure networks around faulty processors. It is also shown how good graph partitioning heuristics may be used to develop a probably good layout strategy. Author (GRA)

N84-19004# University of Western Michigan, Kalamazoo.
ROBUST ESTIMATION BASED ON WALSH AVERAGES FOR THE GENERAL LINEAR MODEL
Gerald L. Sievers Nov. 1983 25 p
(Contract N00014-78-C-0637)
(AD-A136187; TR-72) Avail: NTIS HC A02/MF A01 CSCL 12/1

Estimates of the parameters in a linear model are considered based upon the minimization of a dispersion function of the residuals. The dispersion function used depends on Walsh averages of pairs of residuals. Results similar to those arising with signed rank statistics can be obtained as a special case. Trimming and weighting of the Walsh averages can occur with a suitable choice of dispersion function. Asymptotic properties of this type of dispersion function and its derivatives are developed and used to determine the large sample distribution of the estimates. Some discussion appears on the practical application of this methodology. Author (GRA)

N84-19005# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
FIXED POINT IMPLEMENTATIONS OF FAST KALMAN ALGORITHMS
Louis L. Scharf and Sigurdur Sigurdsson (Colorado State Univ., Fort Collins) Nov. 1983 8 p
(Contract N00014-82-K-0300)
(AD-A136188) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper the authors study scaling rules and round-off noise variances in a fixed point implementation of the Kalman predictor for an ARMA time series observed noise-free. The Kalman predictor is realized in a fast form that uses the so-called fast Kalman gain algorithm. The algorithm for the gain is fixed point. Scaling rules and expressions for rounding error variances are derived. The numerical results show that the fixed point realization performs very closely to the floating point realization for relatively low-order ARMA time series that are not too narrowband. The predictor has been implemented in 16-bit fixed point arithmetic on an INTEL 8086 microprocessor, and in 16-bit floating point arithmetic on an INTEL 8080. Fixed point code was written in ASSEMBLY language and floating point code was witten in FORTRAN. Experimental results were obtained by running the fixed and floating point filters on identical data sets. All experiments were carried out on a INTEL MDS 230 Development System.GRA

N84-19006# Minnesota Univ., Minneapolis. Dept. of Computer Science.
A SYSTOLIC DESIGN RULE CHECKER (SDRC)
Rajiv Kane and Sartaj Sahni Jul. 1983 31 p

(Contract N00014-80-C-0650)
(AD-A136194; TR-83-13) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors develop a systolic design rule checker (SDRC) for rectilinear geometries. This SDRC reports all width and spacing violations. It is expected to result in a significant speed up of the design rule check phase of chip design. Author (GRA)

N84-19007# Virginia Polytechnic Inst. and State Univ., Blacksburg.
RECURSIVE INTERPOLATION OF SPACE-LIMITED SCENES Final Report, 16 Jun. 1982 - 15 Jun. 1983
A. A. L. Beex Jul. 1983 54 p
(Grant AF-AFOSR-0234-82; AF Proj. 2304)
(AD-A136215; AFOSR-83-1125TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The problem of extrapolation of scene-limited functions was investigated with an eye towards accommodating noisy measurements, and incorporating all available a priori information. An iterative projection approach was introduced, aimed specifically at removing a priori information and constraint incompatibility due to noisy measurements. Soft frequency domain measurement constraints and soft scene domain limitation constraints were proposed, and can alleviate convergence problems that occur when the imposed information is not compatible. The soft frequency domain measurement constraint specifically allows the algorithm iterate to deviate from the noisy measurements, in recognition of the fact that the measurements were noisy, and they should therefore not be imposed as an absolute or hard constraint. The resulting alternating projection algorithm was shown to correspond to a non-expansive operator so that many solutions exist, all of which satisfy the a priori information and constraints. Author (GRA)

N84-19008# New York Univ., New York. Lab. for Mathematics and Computing.
PROBLEMS SOLVED AND UNSOLVED CONCERNING LINEAR AND NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS
Peter D. Lax Nov. 1983 32 p refs
(Contract DE-AC02-76ER-03077)
(DE84-004990; DOE/ER-03077/204) Avail: NTIS HC A03/MF A01

Methods used for the solution of linear and nonlinear partial differential equations are reviewed. Two specific problems are discussed in detail: the Laplace-Beltrami operator on complete Riemannian manifolds with constant negative sectional curvature; and the zero dispersion limit for the Korteweg-deVries equations. M.G.

N84-19009# Oak Ridge National Lab., Tenn. Energy Div.
FOURIER-MOTZKIN ELIMINATION AS A TECHNIQUE FOR ERROR LOCALIZATION
G. E. Liepins 1983 10 p refs Presented at the 19th Ann. Meeting of the Southeastern Chapter of the Inst. of Management Sci., Myrtle Beach, S.C., 29-30 Sep. 1983
(Contract W-7405-eng-26)
(DE84-003309; CONF-8309185-1) Avail: NTIS HC A02/MF A01

The minimum weighted fields to impute (MWFI) problem of automatic data editing is disclosed and defined. Five types of solution algorithms are discussed: general fixed charge, mode-disconnect, branch and bound, Chernikova, linear programming based sequential, and Fourier-Motzkin based sequential. The latter (Fourier-Motzkin based sequential) is illustrated with an example. DOE

N84-19010# Sandia Labs., Albuquerque, N. Mex. Applied Mathematics Div.
FACTORIZATION USING THE QUADRATIC SIEVE ALGORITHM
James A. Davis and Diane B. Holdridge Dec. 1983 12 p refs
(Contract DE-AC04-76DP-00789)
(DE84-004140; SAND-83-1346) Avail: NTIS HC A02/MF A01

Since the cryptosecurity of the RSA two key cryptralgorithm is no greater than the difficulty of factoring the modulus (product of two secret primes), a code that implements the Quadratic Sieve factorization algorithm on the CRAY I computer was developed to determine as sharply as possible the current state-of-the-art in factoring. Because all viable attacks on RSA thus far proposed are equivalent to factorization of the modulus, sharper bounds on the computational difficulty of factoring permit improved estimates for the size of RSA parameters needed for given levels of cryptosecurity. Analysis of the Quadratic Sieve indicates that it may be faster than previously published general purpose algorithm for factoring large integers. The high speed of the CRAY I coupled with the capability of the CRAY to pipeline certain vectorized operations make this algorithms (and code) the front runner in current factoring techniques. DOE

N84-19011# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
MULTIGRID METHODS FOR BOUNDARY INTEGRAL EQUATIONS
H. Schippers Dec. 1982 20 p refs Submitted for publication
(NLR-MP-82059-U) Avail: NTIS HC A02/MF A01

Multigrid methods are applied to algebraic systems of equations that occur in the numerical treatment of boundary integral equations of the first and second kind. The methods combine relaxation schemes and coarse grid corrections. The choice of the relaxation scheme is found to be essential to attain a fast convergent iterative process. Theoretical investigations show that the relaxation scheme provides a multigrid algorithm whose rate of convergence increases with the dimension of the finest grid. This is illustrated for the calculation of potential flow around an airfoil. Author (ESA)

N84-19012# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
VARIATIONAL METHODS FOR NONSTANDARD EIGENVALUE PROBLEMS IN WAVEGUIDE AND RESONATOR ANALYSIS
Ismo V. Lindell 1981 30 p refs
(Rept-S-128; ISBN-951-752-471-4) Avail: NTIS HC A03/MF A01

Nonstandard eigenvalue problems are shown to arise in electromagnetic problems, and a unified variational principle is formulated from which stationary functionals for the nonstandard eigenvalues can be constructed. The cutoff problem of a waveguide with surface reactance, propagation problem of an azimuthally magnetized ferrite-filled waveguide, the cutoff problem of corrugated waveguides and the problem of a material insert in a resonator are treated. It is demonstrated that the method leads to good engineering accuracy with very elementary test functions. Author (ESA)

N84-19013# Stanford Univ., Calif. Dept. of Operations Research.
ROUNDING ERRORS IN SOME RECURSIVE METHODS USED IN COMPUTATIONAL PROBABILITY
W. Grassmann Apr. 1983 24 p refs
(Grant NSF ECS-80-17867)
(PB84-124734; SU-TR-73; NSF/ECS-83017) Avail: NTIS HC A02/MF A01 CSCL 12A

It is shown that for many recursive algorithms used in computatonal probability, the error due to rounding and/or chopping is minor. The algorithms analyzed in detail include discrete Markov processes, equilibrium equations for queueing process, and randomization. All these algorithms have in common that they deal with non-negative numbers, and that they contain no subtractions. GRA

N84-19014# Rice Inst., Houston, Tex. Dept. of Electrical Engineering.
A NEW APPROACH TO SYNTHESIS PROBLEMS IN LINEAR SYSTEM THEORY
A. C. Antoulas Apr. 1983 58 p refs
(Grant NSF ECS-81-02895)
(PB84-124742; NSF/ECS-83015) Avail: NTIS HC A04/MF A01 CSCL 12A

A rational nonlinear equation which is involved in the general synthesis (design) problem of linear multivariable systems is considered. The complete solution of this equation, subject to

causality, stability, and minimality constraints, is provided. Format power series and, in particular, the theory of partial realizations, prove of central importance for the design problem. GRA

N84-19015# Rice Univ., Houston, Tex. Dept. of Electrical Engineering.
ALGORITHMS FOR COMPUTING (H SUP (INFINITY SYMBOL)) OPTIMAL TRANSFER FUNCTIONS
Bor-Chin Chang May 1983 36 p refs
(Grant NSF ECS-81-02895)
(PB84-127448; NSF/ECS-83016) Avail: NTIS HC A03/MF A01 CSCL 12A

Three FORTRAN programs are presented for the solution of a (H sup (infinity symbol) -norm optimization problem. These programs are written according to algorithms described in the report. The (H sup (infinity symbol) -norm optimization problem is converted to a generalized interpolation problem, which is then divided into two parts. One of these parts is transformed to an eigen problem, while the other is solved by using the Nevanlinna algorithm. GRA

N84-19016# State Univ. of New York, Binghamton. Dept. of Systems Science.
COMPUTER-AIDED ANALYSIS OF RECONSTRUCTABILITY ANALYSIS OF MANY-DIMENSIONAL RELATIONS
George J. Kir 1983 27 p refs
(Grant NSF ECS-80-06590)
(PB84-127935; NSF/ECS-83014) Avail: NTIS HC A03/MF A01 CSCL 12A

The development of a package of computer-aided methodological tools, referred to as reconstructability analysis, is summarized. It is pointed out that the primary purpose of reconstructability analysis is to provide systems investigators with tools for dealing with the various questions associated with key problem areas of systems studies, including the relationship between wholes and parts, or between overall systems and their subsystems. Four diverse arguments are given for selecting a single system from the reconstruction family on the basis of the maximum entropy principle. One of the main results in the development of the reconstructability analysis is that the maximum entropy reconstruction can be determined by a computationally simple and straightforward procedure without solving the optimization problem. Details of the procedure are provided. Theoretical results regarding the relationship between fuzzy complements and measures of fuzziness are examined. GRA

N84-19139# Naval Ocean Systems Center, San Diego, Calif.
SIGNAL PROCESSING APPLICATIONS OF SYSTOLIC ARRAY TECHNOLOGY (EXTENDED SUMMARY)
H. J. Whitehouse, J. M. Speiser, and K. Bromley *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 5-10 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19141*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PARALLEL VLSI ARCHITECTURE FOR A DIGITAL FILTER USING A NUMBER THEORETIC TRANSFORM
T. K. Truong, I. S. Reed (University of Southern California), C.-S. Yeh (University of Southern California), and H. M. Shao (University of Southern California) *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 19-24 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19143# California Inst. of Tech., Pasadena.
CONCURRENT ALGORITHMS AS SPACE-TIME RECURSION EQUATIONS
Marina C. Chen and Carver A. Mead (California Inst. of Technology) *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 31-52 refs (For primary document see N84-19138 09-82)
(Contract N00014-79-C-0597; ARPA Order 3771)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19144# California Inst. of Tech., Pasadena. Dept. of Computer Science.
A FORMAL DERIVATION OF ARRAY IMPLEMENTATIONS OF FFT ALGORITHMS
Lennart Johnsson and Danny Cohen (University of Southern California, Marina del Rey) *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 53-63 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19148# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
PARALLEL IMPLEMENTATION OF LIKELIHOOD-BASED ESTIMATION AND DETECTION
Donald W. Tufts and Louis L. Scharf *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 76-82 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19153# Naval Underwater Systems Center, New London, Conn.
HIGH RESOLUTION SPECTRUM ANALYSIS BY DOMINANT MODE ENHANCEMENT
Norman L. Owsley *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 114-118 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19154# California Univ., Berkeley. Dept. of Mathematics.
STATE OF THE ART IN EIGENVALUE COMPUTATIONS
B. N. Parlett *In* University of Southern California Proc. of USC Workshop on VLSI and MOd. Signal Process. 15 Nov. 1983 p 119-122 (For primary document see N84-19138 09-82)
(Contract N00014-76-C-0013)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19158# Northwestern Univ., Evanston, Ill. Dept. of EECS.
YIELD ENHANCEMENT BY FAULT TOLERANT SYSTOLIC ARRAYS (SUMMARY)
Robert H. Kuhn *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 145-152 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19167# Office of Naval Research, Washington, D. C.
COMPUTING THEORY AND PRACTICE Final Report
Richard L. Lau *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 208-210 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

N84-19227# Washington State Univ., Pullman.
ESTIMATION: COMMENTS ON LEAST SQUARES AND OTHER TOPICS
Thomas E. Lutz *In* ESA Statist. Methods in Astron. Nov. 1983 p 179-185 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

N84-19238# Lyon Univ. (France). Dept. de Mathematiques.
SOME ASPECTS IN PATTERN RECOGNITION
D. Tounissoux *In* ESA Statist. Methods in Astron. Nov. 1983 p 243-244 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

N84-19239# Strasbourg Univ. (France). Centre d'Etudes Statistiques.
SOME REMARKS ON SECOND ORDER STATIONARY PROCESS (OR WEAK STATIONARITY)
J. C. Turlot *In* ESA Statist. Methods in Astron. Nov. 1983

p 245-248 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-19017# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ERROR MEASUREMENT OF A DETERMINISTIC APPROXIMATION FOR STOCHASTIC PRODUCTION PLANNING PROBLEM [MEDICAO DE ERROS DE UMA APROXIMACAO DETERMINISTICA PARA UM PROBLEMA DE PLANEJAMENTO DE PRODUCAO ESTOCASTICO]
Celso Massaki Hirata and Horacio Hideki Yanasse Jun. 1983 15 p refs In PORTUGUESE; ENGLISH summary Presented at the 16th Brazilian Operation Res. Symp., Florianopolis, Oct. 1983 (INPE-2768-PRE/341) Avail: NTIS HC A02/MF A01

A methodology to estimate the relative error of a deterministic approximation to a stochastic sequential production planning problem is presented. The difficulty in estimating these errors is in the determination of a lower bound to the sequential problem. The latter is of extremely complex situation, perhaps unknown unless special cost functions are used. The suggested methodology utilizes digital simulation to get an estimate of the upper and lower bounds to the optimal solution of the problem. Some limited computational results are presented using a production planning problem where it is admitted that demands are normally distributed. Author

N84-19018# North Carolina Univ., Chapel Hill. Dept. of Statistics.
RESEARCH IN STOCHASTIC PROCESSES Interim Report, 1 Nov. 1981 - 31 Oct. 1982
S. Cambanis, R. J. Carroll, G. Kallianpur, and M. R. Leadbetter 31 Oct. 1982 72 p
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A136222; AFOSR-83-1234TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Research was conducted and directed in the area of stochastic processes by three Principal Investigators and their associates, and in estimation in statistical models. The main areas of research activity for each principal investigator and coworkers are as follows: (1) asymptotic optimal quantizers, complex symmetric stable variables and processes, prediction and representation of stable processes, nonparametric spectral density estimation for stable processes, delayed delta and pulse code modulation; (2) Feynman integrals, stochastic nonlinear filtering, stationary random fields, stochastic differential equations and diffusion approximation models for neuron activity, white noise and generalized Brownian functionals, stochastic Radon transforms, splicing of measures; and (3) extreme values of stationary stochastic sequences and processes, dependence structure of stochastic processes, extremes of nonstationary normal sequences, estimation of point process intensities. GRA

N84-19019# Stanford Univ., Calif. Dept. of Statistics.
AVERAGE RUN LENGTHS OF AN OPTIMAL METHOD OF DETECTING A CHANGE IN DISTRIBUTION
M. Pollak Sep. 1983 54 p
(Contract N00014-77-C-0306)
(AD-A136385; SU-TR-22) Avail: NTIS HC A04/MF A01 CSCL 12/1

Suppose one accumulates independent observations from a certain process. Initially, the process is at State 0. At some unknown point in time something occurs (e.g., a breakdown) which puts the process in State 1, and consequently the stochastic behavior of the observations changes. It is of interest to declare that a change took place (to raise an alarm) as soon as possible after its occurrence, subject to a restriction on the rate of false detections. It is assumed that the aforementioned observations are the only information one has about the process, and the problem is to construct a good detection scheme. Practical examples of this problem arise in areas such as health, quality control, ecological monitoring, etc. For instance, consider surveillance for congenital malformations in newborn infants. Under normal circumstances, the percentage of babies born with a certain type of malformation has a known value. Should something occur (such as an environmental change, the introduction of a new drug to the market, etc.) the percentage may increase. One would want to raise an alarm as quickly as possible after a change would have taken place, subject to an acceptable rate of false alarms. GRA

N84-19020# Wisconsin Univ., Madison. Mathematics Research Center.
A UNIFIED APPROACH TO ARMA (AUTOREGRESSIVE-MOVING AVERAGE) MODEL IDENTIFICATION AND PRELIMINARY ESTIMATION
G. T. Wilson and D. Piccolo Nov. 1983 35 p
(Contract DAAG29-80-C-0041)
(AD-A136426; MRC-TSR-2592) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper reviews several different methods for identifying the orders of autoregressive-moving average models for time series data. The case is made that these have a common basis, and that a unified approach may be found in the analysis of a matrix G, defined to be the covariance matrix of forecast values. The estimation of this matrix is considered, emphasis being placed on the use of high order autoregression to approximate the predictor coefficients. Statistical procedures are proposed for analyzing G, and identifying the model orders. A simulation example and three sets of real data are used to illustrate the procedure, which appears to be very useful as a tool for order identification and preliminary model estimation. Author (GRA)

N84-19021# Cornell Univ., Ithaca, N.Y. School of Operations Research and Industrial Engineering.
THE JACK KIEFER-JACOB WOLFOWITZ MEMORIAL STATISTICAL RESEARCH CONFERENCE Final Report
R. E. Bechhofer Dec. 1983 49 p Conf. held at Ithaca, N.Y., 6-9 Jul. 1983
(Contracts DAAG29-83-M-0234; N00014-83-G-0101; Grant NSF MCS-82-10822)
(AD-A136490) Avail: NTIS HC A03/MF A01 CSCL 12/1

This is a report on the Jack Kiefer-Jacob Wolfowitz Statistical Research Conference held at Cornell University, Ithaca, New York, July 6-9, 1983. Topics covered included admissibility and inference, combinatorial design, information and coding theory, multivariate analysis, optimal design, selection theory, and sequential analysis. GRA

N84-19022# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
ASPECTS OF PATTERN THEORY Final Report, 1 Oct. 1977 - 30 Nov. 1981
Ulf Grenander and Donald E. McClure 30 Nov. 1981 25 p
(Grant AF-78-3514; AF Proj. 2304)
(AD-A136506; AFOSR-83-1249TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research in this project is motivated by pattern analysis, the study of regular structures in natural and man-made phenomena. Problems of inferring structural representations of observed patterns raise new problems of nonparametric statistical inference. The method of sieves has been developed as a general approach for adapting classical techniques of inference, such as maximum likelihood for estimation, to nonparametric settings. To develop the basic probabilistic models that form the foundation for statistical inference of patterns, characterization results have been obtained that prescribe the kinds of probability models generated by the regularity constraints of pattern theory. The mathematical questions have been studied both by analytical and computational methods. The computer experiments have led to

the development of a substantial library of APL programs for mathematical experimentation. Numerous applications are described in the publications from the project. Author (GRA)

N84-19023# Northwestern Univ., Evanston, Ill.
MARKOV PROCESSES APPLIED TO CONTROL, REPLACEMENT, AND SIGNAL ANALYSIS Interim Report, 1 Jun. 1982 - 31 May 1983
Erhan Cinlar Aug. 1983 9 p
(Grant AF-82-0189; AF Proj. 2304)
(AD-A136508; AFOSR-83-1277TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research efforts during this period concentrated on the following topics: (1) Deformation of Solids; (2) Markov and Semimarkov Models of Deterioration; (3) Regenerative Systems and Markov Additive Processes; (4) Excursions of Markov Processes; and (5) Brownian Motion on Riemannian Manifolds. GRA

N84-19024# Johns Hopkins Univ., Baltimore, Md. Dept. of Mathematical Sciences.
ESTIMATION AND RECONSTRUCTION FOR STOCHASTIC PROCESSES AND DETERMINISTIC FUNCTIONS Interim Report, 1 Jan. - 31 Dec. 1982
Alan F. Karr 14 Feb. 1983 14 p
(Grant AF-AFOSR-0029-82; AF Proj. 2304)
(AD-A136571; AFOSR-83-1239TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Method for statistical estimation of parameters of partially observed stochastic processes and for minimum mean squared error reconstruction of unobserved portions of sample paths (state estimation) were developed. Some of these methods apply to models of random distributions of particles in space or events in time; others apply to Markov processes. Statistical estimators are asymptotically exact even though certain of the unknown parameters are infinite-dimensional. For several classes of processes the problem of simultaneously performing parameter estimation and state estimation was solved. Refined techniques for reconstructing a deterministic signal from hard-limited data were devised.
Author (GRA)

N84-19025# Wisconsin Univ., Milwaukee. Dept. of Physics.
LATTICE STATISTICS Interim Scientific Report, 1 Jul. 1982 - 30 Jun. 1983
Richmond B. McQuistan 30 Jun. 1983 12 p
(Grant AF-AFOSR-0192-81; AF Proj. 2304)
(AD-A136588; AFOSR-83-1233TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The objective of this research is to develop the mathematical formalism necessary to treat correlative statistics for lattice spaces. Toward that goal the investigators are considering (1) the composite kth neighbor degeneracy problem for indistinguishable particles distributed on one dimensional rectangular lattice space; (2) the occupational degeneracy for dumbbells and lambda-bell particles on saturated and unsaturated, rectangular lattice spaces of higher dimensionality here they are considering dumbbells that may have either indistinguishable or distinguishable ends; (3) the nearest neighbor degeneracy problem for simple, indistinguishable particles distributed on rectangular lattice spaces of higher dimensionality. A secondary objective is to exploit the results of the foregoing research by investigating the consequences of this formalism to chemical and physical systems. Most notably they are considering adsorption processes. The investigators have developed set theoretic arguments that hold the promise of treating successfully a number of problems concerning correlative statistics for lattice spaces. Utilizing this technique they have been able to describe exactly the occupational degeneracy for correlated particles such as dumbbells and lambda-bell particles distributed on lattice spaces of two and three dimensions. The investigators have also utilized these set theoretic arguments to obtain recursion relations that yield exactly the composite nearest, next nearest and third nearest neighbor degeneracies for simple particles distributed on rectangular lattice spaces of higher dimensionality. Author (GRA)

N84-19026# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
A MULTIVARIABLE REGRESSION ALGORITHM
G. L. Blaisdell and T. Carpenter Nov. 1983 46 p
(DA Proj. 4A7-62730-AT-42)
(AD-A136630; CRREL-SR-83-32) Avail: NTIS HC A03/MF A01 CSCL 12/1

A BASIC algorithm has been developed that is capable of fitting a user-defined regression equation to a set of data. This best-fit-curve algorithm is unique in that it allows multiple variables and multiple forms (exponential, trigonometric, logarithmic, etc.) to be present in a single regression equation. The least-squares regression performed determines the constants for each of the regression equation terms to provide a best-fit curve. Other programs within the algorithm set allow for data entry, editing and print-out, and plotting of the raw data and their best-fit regression curve. Author (GRA)

N84-19027# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
CONVERGENCE THEORIES OF DISTRIBUTED ITERATIVE PROCESS: A SURVEY
D. P. Bertsekas, J. N. Tsitsiklis (Stanford Univ.), and M. Athans Dec. 1983 43 p
(Contracts N00014-75-C-1183; N00014-77-C-0532; Grant NSF ECS-82-17668; NR Proj. 041-519)
(AD-A135875; LIDS-P-1342) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors consider a model of distributed iterative algorithms whereby several processors participate in the computation while collecting, possibly stochastic information from the environment or other processors via communication links. Several applications in distributed optimization, parameter estimation, and communication networks are described. Issues of asymptotic convergence and agreement are explored under very weak assumptions on the ordering of computations and the timing of information reception. Progress towards constructing a broadly applicable theory is surveyed. Author (GRA)

N84-19028# North Carolina Univ., Charlotte. Dept. of Mathematics.
[RESEARCH ON SHOCK MODELS, WEAR PROCESSES, REPLACEMENT AND MAINTENANCE POLICIES] Final Interim Report, 1 Jul. 1982 - 30 Jun. 1983
M. Abdel-Hameed Aug. 1983 10 p
(Grant AF-AFOSR-0245-80; AF Proj. 2304)
(AD-A135620; AFOSR-83-0818TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The Principal Investigator and the Co-investigator attended four conferences giving papers at two of them. The Principal Investigator organized a Conference on Stochastic Failure Models, Replacement and Maintenance Policies, Accelerated Life Testing. He continued his research on shock models, wear processes, replacement and maintenance policies; revised the paper Life Distribution Properties of Devices Subject to a Levy Wear Process, wrote the paper Pure Jump Damage Processes. He also wrote Conservative and Dissipative Parts of Non-Measure Preserving Weighted Composition Operators. The Co-investigator presented a paper on Approximate Optimal Replacement Policies and Their Stability. GRA

N84-19029# Maryland Univ., College Park. Dept. of Management Sciences and Statistics.
INSPECTION ERRORS IN LINK SAMPLING
Samuel Kotz, Norman L. Johnson (North Carolina Univ., Chapel Hill), and Robert N. Rodriquez Dec. 1983 14 p
(Contract N00014-81-K-0301)
(AD-A135636; UMD-DMSS-83/6) Avail: NTIS HC A02/MF A01 CSCL 12/1

Results of an investigation into the sensitivity to two types of inspection error of link sampling procedures described by Harish-chandra and Srivenkataramana are reported. Relevant compound distributions are derived. Some comparisons with results obtained

in a similar investigation for standard double sampling are also given. Author (GRA)

N84-19030# University of Western Michigan, Kalamazoo. Dept. of Mathematics.
A ROBUST MULTIPLE CORRELATION COEFFICIENT FOR THE RANK ANALYSIS OF LINEAR MODELS
G. L. Sievers Sep. 1983 26 p
(Contract N00014-78-C-0637)
(AD-A135666; TR-69) Avail: NTIS HC A03/MF A01 CSCL 12/1

A multiple correlation coefficient is discussed to measure the degree of association between a random variable Y and a set of random variables X sub I, ..., X sub p. The coefficient is defined in terms of weighted Kendall's tau, suitably normalized. It is directly compatible with the rank statistic approach of analyzing linear models in a regression, prediction context. The population parameter equals the classical multiple correlation coefficient if the multivariate normal model holds but would be more robust for departures from this model. Some results are given on the consistency of the sample estimate and on a test for independence. Author (GRA)

N84-19031# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
COMMENT ON GRAPHICAL METHODS FOR ASSESSING LOGISTIC REGRESSION MODELS BY LANDWEHR, PREGIBON AND SHOEMAKER Technical Report
S. E. Fienberg and G. D. Gong Sep. 1983 18 p
(Contract N00014-80-C-0637)
(AD-A135684; TR-299) Avail: NTIS HC A02/MF A01 CSCL 12/1

The use of graphical methods for diagnostic purposes has an honorable tradition which is rooted in the pioneering work of Anscombe and Tukey and has been developed by Wilk, Gnanadesikan, and a host of others associated with Bell Laboratories. A paper by Landwehr, Pregibon, and Shoemaker (subsequently referred to as LPS) attempts to modify and extend graphical diagnostic displays that have been developed for ordinary regression to be of use for assessing logistic regression models for binary data. They propose displays for each of the three key components of regression diagnostics: goodness of fit, outliner detection, and model specification. Their is a pioneering effort and many useful ideas have emerged from it. Somewhat fuzzy analogies to linear regression are not sufficient to motivate the approaches adopted by LPS. Thus the authors of this paper have attempted to examine critically LPS's diagnostic displays to see if they could determine why in each instance the method works or fails. LPS suggest that the major obstacle in carrying linear regression diagnostics over to the logistic regression setting is the discreteness of binary data. While discreteness may well be a serious problem, additional ones are noted. GRA

N84-19032# University of Western Michigan, Kalamazoo. Dept. of Mathematics.
TESTING HYPOTHESES IN LINEAR MODELS WITH WEIGHTED RANK STATISTICS
Gerald L. Sievers Nov. 1983 32 p
(Contract N00014-78-C-0637; NR Proj. 042-407)
(AD-A135759; TR-71) Avail: NTIS HC A03/MF A01 CSCL 12/1

Tests of hypotheses for the parameters in a general linear model are considered based on weighted rank statistics. Results are presented for tests based on a rank estimate, tests based on drop in dispersion and aligned rank tests. Weights can be used to focus the analysis on simple effects and provide an additional degree of robustness to rank tests. Several analysis of variance applications are discussed. Author (GRA)

N84-19033# Stanford Univ., Calif. Dept. of Statistics.
SOME ALTERNATIVES TO BAYES' RULE
P. Diaconis and S. Zabell 29 Nov. 1983 17 p
(Contract N00014-76-C-0475)
(AD-A135944; SU-TR-339) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document focuses on two proposed alternatives to Bayes' rule for revising probability assessments in the face of new information: Richard Jeffrey's rule of conditioning and Arthur Dempster's rule of combination. Section 2 describes Jeffrey's rule. Section 3 describes upper and lower probabilities and Dempster's rule for their combination. Section 4 shows that the two rules are in fact closely connected: Jeffrey's rule is the additive version of Dempster's rule in those situations where the two rules are comparable. GRA

N84-19034# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
TOWARDS A COMPREHENSIVE APPROACH TO THE ANALYSIS OF CATEGORICAL DATA
S. E. Fienberg Jun. 1983 30 p
(Contract N00014-80-C-0637)
(AD-A135967; TR-287) Avail: NTIS HC A03/MF A01 CSCL 12/1

Current methodology for the analysis of categorical data can be traced to two papers published in 1900, one by Pearson and one by Yule. The keys to the linking of their ideas have been the use of linear models and inferential tools due to Fisher. After 50 years of research, statisticians have come close to developing a comprehensive approach to categorical data problems that stresses three basic themes; interpretability, flexibility, and computability. This paper surveys the evolution of this comprehensive approach and classes of problems for which it has proven useful. A concluding section contains some speculation on unsolved methodological problems of current interest and on future developments. Author (GRA)

N84-19035# California Univ., Berkeley. Operations Research Center.
APPROXIMATING THE DISTRIBUTION OF A DYNAMIC RISK PORTFOLIO
W. S. Jewell Nov. 1983 30 p
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A136039; ORC-83-15) Avail: NTIS HC A03/MF A01 CSCL 12/1

In a previous paper, Jewell and Sundt showed how to approximate the distribution of total losses from a large, fixed heterogeneous portfolio, using a recursive algorithm developed by Panjer for the distribution of a random sum of random variables (a single casualty contract). This paper extends the approximation procedure to large, dynamic heterogeneous portfolios, in order to model either a portfolio of correlated casualty contracts, or a future portfolio, whose composition is not known with certainty. Author (GRA)

N84-19036# Alabama Univ., University. Dept. of Management Science and Statistics.
INTEGRATING MULTI-OBJECTIVE OPTIMIZATION METHODOLOGIES IN BMD TECHNOLOGY
J. M. Mellichamp 15 Oct. 1983 193 p
(Contract DASG60-81-C-0008)
(AD-A136161) Avail: NTIS HC A09/MF A01 CSCL 12/1

This technical report describes a microprocessor version of a threat allocation model based on simple decision heuristics. Model capability is demonstrated by allocating a threat composed of four reentry vehicles (r.v.) systems over four categories of assets using different asset defense schemes. Allocations obtained with the heuristic model compare favorably with allocations obtained with a much more sophisticated model. The report also describes a generalized R&D project network simulation model which provides reliable estimates for project start and completion times, project duration times, and failure statistics. The simulation model is demonstrated with a complex network composed of six individual, interdependent projects. The report includes as an appendix a paper describing a mathematical optimization approach to threat allocation decisions. GRA

N84-19220# Osservatorio Astronomico, Brera, Milan (Italy).
SOME APPLICATIONS OF MULTIPLE REGRESSION ANALYSIS
E. Antonello *In* ESA Statist. Methods in Astron. Nov. 1983 p 145-148 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

N84-19237# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France). Centre de Mathematiques.
A SET FUNCTION APPROACH TO CLUSTER ANALYSIS
Hubert Emptoz and Robert Fages *In* ESA Statist. Methods in Astron. Nov. 1983 p 235-241 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-19037# Advanced Information and Decision Systems, Mountain View, Calif.
DYNAMIC SEQUENCE ASSIGNMENT Final Technical Report, 12 Jan. 1981 - 30 Dec. 1983
Cindy A. OReilly, Vladislav V. Rutenburg, Edison Tse, and Richard P. Wishner Dec. 1983 156 p
(Contract N00014-82-C-0085; AI&DS Proj. 1026)
(AD-A136548; AI/DS-TR-1026-1) Avail: NTIS HC A08/MF A01 CSCL 01/2

This report addresses the problem of building an interactive decision aid for near optimal aircraft mission planning. Mathematical formulations for dynamic sequential assignment of aircraft to targets/defenses in the mission planning process are presented. Several new mathematical algorithms for the solution of this problem are presented. An overview of the interactive mission planning methodology is also included. GRA

N84-19038# California Univ., Berkeley. Operations Research Center.
VARIOUS ASPECTS OF NETWORK RELIABILITY Interim Scientific Report, 1 Jun. 1982 - 31 May 1983
Richard E. Barlow 5 May 1983 16 p
(Grant AF-AFOSR-0122-81; AF Proj. 2304)
(AD-A136579; AFOSR-83-1244TR) Avail: NTIS HC A02/MF A01 CSCL 12/2

Three researchers and one visitor were supported by this grant during this period. Most of the research was in various aspects of reliability, including network reliability, a generalized model of continuous reliability growth, a software reliability model combining the results of several independent inspectors, and a model in which the failure rates for components depend on the working set. Other investigations included Bayesian methods for combining expert opinion, enriched prior distributions for the multinormal distribution, and a new approach to using simulation to estimate first-passage time distributions for Markov chains. Eleven research papers and one Ph.D dissertation were produced during this period. This report summarizes research results and lists publications generated during this period. Author (GRA)

N84-19039# Duke Univ., Durham, N. C. Dept. of Computer Science.
SEARCH WITH LIMITED RESOURCES
D. C. Mutchler Feb. 1983 55 p
(Grant AF-AFOSR-0221-81; AF Proj. 2304)
(AD-A136122; CS-1983-1; AFOSR-83-1154TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Most game-playing programs make each move after conducting only a partial search of the game tree and applying a static evaluation function at the terminal nodes of that partial search. Given limited resources, what is the optimal partial search to perform? This report presents a model for investigating this question. Results (including the answer to the above question) are obtained for a restricted case of the model. Author (GRA)

N84-19040# Stanford Univ., Calif. Dept. of Operations Research.
AVERAGE OPTIMALITY CRITERIA IN THE PROBLEMS WITH UNLIMITED CONTROL RATES
M. I. Taksar Apr. 1983 50 p refs
(Grant NSF ECS-80-17867)
(PB84-127943; NSF/ECS-83-18; TR-74) Avail: NTIS HC A03/MF A01 CSCL 12B

The problem of minimization of average (per unit of time) expected cost is considered. The case of a convex holding cost function, h, which is either finite everywhere or infinite outside a finite interval, is examined. A sequence of discounted problems is presented and the optimality equations are derived. It is shown that a solution of these equations gives a solution to the problem of optimal control. The equations which the optimal boundaries must satisfy are explored and reduced to a Stephan (free boundary) problem. A special game version of an optimal stopping problem is developed and it is shown that the value of the game is the solution of the Stephan problem. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-19041# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
HARMONIZABLE STABLE PROCESSES ON GROUPS: SPECTRAL, ERGODIC AND INTERPOLATION PROPERTIES
Aleksander Weron (Wroclaw Univ.) Jun. 1983 37 p
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A136504; TR-32; AFOSR-83-1270TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This work extends to symmetric alpha-stable (S alpha S) processes, $1 < \text{alpha} < 2$, which are Fourier transforms of independently scattered random measures on locally compact Abelian groups, some of the basic results known for processes with finite second moments and for Gaussian processes. Analytic conditions for subordination of left (right) stationarily related processes and a weak law of large numbers are obtained. The main results deal with the interpolation problem. Characterization of minimal and interpolable processes on discrete groups are derived. Also formulas for the interpolator and the corresponding interpolation error are given. This yields a solution of the interpolation problem for the considered class of stable processes in this general setting. Author (GRA)

N84-19042# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
NONLINEAR SYSTEMS IN INFINITE DIMENSIONAL STATE SPACES Interim Technical Progress Report, for period ending 14 Jun. 1983
Marshall Slemrod Jul. 1983 9 p
(Grant AF-AFOSR-0172-81; AF Proj. 2304)
(AD-A136530; AFOSR-83-1258TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period of research, efforts were made in the areas of: (1) controllability of infinite dimensional bilinear control systems; (2) singular perturbations approach to optimization problems with nonconvex cost; (3) nonlinear continuum mechanics and phase transitions; and (4) optimal control of a problem arising in robotics. Results are obtained in all areas using various methods of nonlinear analysis. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-19043# Academy of Sciences (USSR), Moscow. Space Research Inst.

THE STABILITY OF ELLIPTICAL STELLAR DISKS. BALANCED DISKS
G. S. Bisnovatyi-Kogan 1983 50 p refs In RUSSIAN; ENGLISH summary
(Pr-826) Copyright. Avail: Issuing Activity

The stability of the balanced elliptical disks with quadratic gravitational potential (QGP) is investigated relative to bar-like perturbations for binary systems and in the presence of spheroidal halo. In binary systems the elongated disks and compressed disks close to the circular ones are aperiodically unstable. Strongly compressed disks are stable for large ratio of masses: M/M2 or M2/M is greater approximately 30; the oscillating instability takes place for intermediate mass ratio. The disks in the uniform spheroidal halo are stabilized relative to the bar-like perturbations if the gravitational potential of the halo exeeds one half of gravitational potential of the disk. The kinetic, potential energy and angular momentum of balanced disks are calculated. The virial theorem is checked for binary galaxies when their relative influence is taken into account in tidal approximation. Author

N84-19044*# Yale Univ., New Haven, Conn. Section of Applied Physics.
ROTATIONAL CARS APPLICATION TO SIMULTANEOUS AND MULTIPLE-POINT TEMPERATURE AND CONCENTRATION DETERMINATION IN A TURBULENT FLOW Final Contractor Report, 1 Mar. 1980 - 28 Feb. 1983
Judith B. Snow, Daniel V. Murphy, and Richard K. Chang Washington NASA Feb. 1984 160 p refs
(Grant NAG1-37)
(NASA-CR-3783; NAS 1.26:3783) Avail: NTIS HC A08/MF A01 CSCL 14B

Coherent Anti-stokes Raman Scattering (CARS) from the pure rotational Raman lines of N2 is employed to measure the instantaneous rotational temperature of N2 gas at room temperature and below with good spatial resolution. A broad-bandwidth dye laser is used to obtain the entire rotational spectrum from a signal laser pulse; the CARS signal is then dispersed by a spectrograph and recorded on an optical multichannel analyzer. A best-fit temperature is found in several seconds with the aid of a computer for each experimental spectrum by a least squares comparison with calculated spectra. The model used to calculate the theoretical spectra incorporates the temperature and pressure dependence of the pressure-broadened rotational Raman lines, includes the nonresonant background susceptibility, and assumes that the pump laser has a finite linewidth. Temperatures are fit to experimental spectra recorded over the temperature range of 135 to 296K, and over the pressure range of 0.13 to 15.3 atm. In addition to the spatially resolved single point work, we have used multipoint CARS to obtain information from many spatially resolved volume elements along a cylindrical line (0.1 x 0.1 x 2.0 mm). We also obtained qualitative information on the instantaneous species concentration and temperature at 20 spatially resolved volume elements (0.1 x 0.1 x 0.1 mm) along a line. Author

N84-19045# Kent State Univ., Ohio.
METASTABLE SUPERCONDUCTING PAIRS WITH LARGE MOMENTUM Final Scientific Report, 15 Feb. 1982 - 15 Jan. 1983
D. W. Allender Jun. 1983 9 p
(Grant AF-AFOSR-0105-82; AF Proj. 2301)
(AD-A136246; AFOSR-83-1227TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

A theoretical study of the possibility of finite momentum pairing in one and two dimensional superconductors was carried out. When the effects of zero momentum pairing, finite momentum pairing, and a charge density wave were simultaneously considered for a one dimensional system, it was found that the relative phases of the complex gap parameters for each of the three types of order were important. The resulting energy gap was obtained, and the nature of the ground state was examined and found to depend on the values of the effective interaction coupling constants. For the two dimensional system, it was shown that analogous to previously known results in one dimension, the binding energy of electron pairs, as a function of momentum, has a relative maximum at momentum greater than twice the Fermi momentum. Author (GRA)

N84-19046# Naval Research Lab., Washington, D. C.
REACTIVE SHOCK PHENOMENA IN CONDENSED MATERIALS: FORMULATION OF THE PROBLEM AND METHOD OF SOLUTION Interim Report
R. Guirguis (Berkeley Research Associates, Springfield, Va.) and E. Oran 9 Dec. 1983 44 p Sponsored by ONR
(RR0130646)
(AD-A136514; AD-E000555; NRL-MR-5228) Avail: NTIS HC A03/MF A01 CSCL 19/4

A reactive shock simulation model used to study the formation and propagation of shocks and detonations in condensed phase materials is described. Two test cases are given: (1) laser initiation of a shock wave propagating through water, and (2) the development of a detonation front from a hot spot in liquid nitromethane. GRA

N84-19047# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.
AN INVESTIGATION OF RF CURRENTS IN A MAGNETIZED PLASMA USING A SLOW WAVE STRUCTURE Final Scientific Report, 1 Oct. 1978 - 31 Dec. 1982
B. R. Poole and B. R. Cheo Oct. 1983 126 p
(Grant AF-AFOSR-0009-79; AF Proj. 2301)
(AD-A135880; POLY-EE-83-004; AFOSR-83-1057TR) Avail: NTIS HC A07/MF A01 CSCL 20/3

An investigation of the interaction of electrostatic waves launched by a slow wave structure with a magnetized plasma is made. The characteristics of the electrostatic waves and the electron dynamics are studied experimentally. Of primary experimental interest is the measurement of the electron energy distribution and the RF-induced electron flux along the background magnetic field. This interest is motivated by a need for a more complete understanding of interaction of plasma with a slow wave electrostatic field which is of importance for RF-heating and RF dc current drive in plasmas. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N84-19048*# Kentron International, Inc., Hampton, Va.
AN EMPIRICAL METHOD FOR PREDICTING THE MIXING NOISE LEVELS OF SUBSONIC CIRCULAR AND COAXIAL JETS Final Report
James W. Russell Washington. NASA Feb. 1984 123 p refs
(Contract NAS1-16000)
(NASA-CR-3786; NAS 1.26:3786) Avail: NTIS HC A06/MF A01 CSCL 20A

An empirical method for predicting the static free field source noise levels of subsonic circular and coaxial jet flow streams is presented. The method was developed from an extensive data base of 817 jet tests obtained from five different government and industry sources in three nations. The prediction method defines the jet noise in terms of four components which are overall power level, power spectrum level, directivity index, and relative spectrum level. The values of these noise level components are defined on a grid consisting of seven frequency parameter values (Strouhal numbers) and seven directivity angles. The value of the noise level at each of these grid points is called a noise level coordinate and was defined as a function of five jet exhaust flow state parameters which are equivalent jet velocity, equivalent jet total temperature, the velocity ratio (outer stream to inner stream), temperature ratio, and area ratio. The functions were obtained by curve fitting in a least squares sense the noise level coordinates

from the data base in a five dimensional flow state space using a third order Taylor series. The noise level coordinates define the component noise levels for all frequencies and directivities through a bicubic spline function. Author

N84-19049*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMPLIFIED COMBUSTION NOISE THEORY YIELDING A PREDICTION OF FLUCTUATING PRESSURE LEVEL
Ronald G. Huff Feb. 1984 17 p refs
(NASA-TP-2237; E-1856; NAS 1.60:2237) Avail: NTIS HC A02/MF A01 CSCL 20A

The first order equations for the conservation of mass and momentum in differential form are combined for an ideal gas to yield a single second order partial differential equation in one dimension and time. Small perturbation analysis is applied. A Fourier transformation is performed that results in a second order, constant coefficient, nonhomogeneous equation. The driving function is taken to be the source of combustion noise. A simplified model describing the energy addition via the combustion process gives the required source information for substitution in the driving function. This enables the particular integral solution of the nonhomogeneous equation to be found. This solution multiplied by the acoustic pressure efficiency predicts the acoustic pressure spectrum measured in turbine engine combustors. The prediction was compared with the overall sound pressure levels measured in a CF6-50 turbofan engine combustor and found to be in excellent agreement. Author

N84-19050*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HELICOPTER IMPULSIVE NOISE: THEORETICAL AND EXPERIMENTAL STATUS
F. H. Schmitz and Y. H. Yu Nov. 1983 105 p refs Prepared in cooperation with Army Research and Technology Labs., Moffett Field, Calif.
(NASA-TM-84390; A-9477; NAS 1.15:84390; USAAVRADCOM-TR-83-A-2) Avail: NTIS HC A06/MF A01 CSCL 20A

The theoretical and experimental status of helicopter impulsive noise is reviewed. The two major source mechanisms of helicopter impulsive noise are addressed: high-speed impulsive noise and blade-vortex interaction impulsive noise. A thorough physical explanation of both generating mechanism is presented together with model and full-scale measurements of the phenomena. Current theoretical prediction methods are compared with experimental findings of isolated rotor tests. The noise generating mechanism of high speed impulsive noise are fairly well understood - theory and experiment compare nicely over Mach number ranges typical of today's helicopters. For the case of blade-vortex interaction noise, understanding of noise generating mechanisms and theoretical comparison with experiment are less satisfactory. Several methods for improving theory-experiment are suggested. Author

N84-19051*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRCRAFT AND BACKGROUND NOISE ANNOYANCE EFFECTS
Kelli F. Willshire Jan. 1984 31 p refs Presented at Human Factors Soc. Ann. Meeting, Norfolk, Va. 10-14 Oct. 1983
(NASA-TM-85744; NAS 1.15:85744) Avail: NTIS HC A03/MF A01 CSCL 20A

To investigate annoyance of multiple noise sources, two experiments were conducted. The first experiment, which used 48 subjects, was designed to establish annoyance-noise level functions for three community noise sources presented individually: jet aircraft flyovers, air conditioner, and traffic. The second experiment, which used 216 subjects, investigated the effects of background noise on aircraft annoyance as a function of noise level and spectrum shape; and the differences between overall, aircraft, and background noise annoyance. In both experiments, rated annoyance was the dependent measure. Results indicate that the slope of the linear relationship between annoyance and noise level for traffic is significantly different from that of flyover and air conditioner noise and that further research was justified to determine the influence of the two background noises on overall, aircraft, and background noise annoyance (e.g., experiment two). In experiment two, total noise exposure, signal-to-noise ratio, and background source type were found to have effects on all three types of annoyance. Thus, both signal-to-noise ratio, and the background source must be considered when trying to determine community response to combined noise sources. A.R.H.

N84-19052*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE-REDUCTION MEASUREMENTS OF STIFFENED AND UNSTIFFENED CYLINDRICAL MODELS OF AN AIRPLANE FUSELAGE
Conrad M. Willis and William H. Mayes Feb. 1984 28 p refs
(NASA-TM-85716; L-15699; NAS 1.15:85716) Avail: NTIS HC A03/MF A01 CSCL 20A

Noise-reduction measurements are presented for a stiffened and an unstiffened model of an airplane fuselage. The cylindrical models were tested in a reverberant-field noise environment over a frequency range from 20 Hz to 6 kHz. An unstiffened metal fuselage provided more noise reduction than a fuselage having the same sidewall weight divided between skin and stiffening stringers and ring frames. The addition of acoustic insulation to the models tended to smooth out the interior-noise spectrum by reducing or masking the noise associated with the structural response at some of the resonant frequencies. Author

N84-19053# National Aerospace Lab., Tokyo (Japan).
SUPPRESSION OF PEAK NOISE BY RESHAPING COAXIAL FLOW CIRCUMFERENTIALLY UNDER STATIC CONDITIONS
K. Takeda and H. Nishiwaki 1982 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-770; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The combination of a circular fan/elliptic core nozzle was tested and compared with the results of a conventional circular core/circular fan nozzle under static flow conditions. The results show that there occurred a change of the directiveness of jet noise around the nozzle when using the circular/elliptic nozzle combination. In a 30 to approximately 50 degree direction from the jet axis, a 3 to approximately 5 dB reduction was observed. Radial velocity distribution was measured by using LDV and axial sound source distribution by the polar correlation method in an anechoic room. Based on these measurements the relation between sound pressure generation and velocity distribution around the exhaust nozzle was discussed. A circular/elliptic nozzle combination for turbo-fan engine exhaust nozzle combination for turbo-fan engine exhaust nozzle was recommended. Author

N84-19054# Wisconsin Univ., Madison. Mathematics Research Center.
ON ARMA (AUTOREGRESSIVE MOVING AVERAGE) REPRESENTATIONS FOR WHITE NOISE IN A MARKOVIAN ENVIRONMENT
P. W. Glynn Oct. 1983 11 p
(Contract DAAG29-80-C-0041)
(AD-A136354; MRC-TSR-2588) Avail: NTIS HC A02/MF A01 CSCL 12/1

Autoregressive moving average (ARMA) models are frequently used to describe disturbances associated with signals. Usually, such processes are discussed in the context of finite dimensional linear systems. In this note, the author shows, that ARMA models also occur in a rather different setting, namely as descriptions of white noise in a randomly varying environment. Such a result is useful in better understanding the proper role of ARMA processes in systems theory. GRA

N84-19055# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
COCHLEAR MECHANICS: ANALYSIS FOR A PURE TONE
M. H. Holmes and J. D. Cole 7 Nov. 1983 60 p
(Contract DAAG29-83-K-0092)

(AD-A136438; RPI-MATH-139; ARO-20474.1-MA) Avail: NTIS HC A04/MF A01 CSCL 12/1

The dynamical response of a three-dimensional hydroelastic model of the cochlea is studied for a pure tone forcing. The basilar membrane is modeled as an inhomogenous, orthotropic elastic plate and the fluid is assumed to be Newtonian. The resulting mathematical problem is reduced using viscous boundary layer theory and slender body approximations. This leads to a nonlinear eigenvalue problem in the transverse cross-section. The solutions for the case of a rectangular and semi-circular cross-section are computed and comparison is made with experiment. The role of the place principle in determining the difference limen is presented and it is shown how the theory agrees with the experimental measurements. Author (GRA)

N84-19056# Illinois Univ., Urbana. Coordinated Science Lab.
INVESTIGATION OF HIGH EFFICIENCY LARGE TBW LINE ACOUSTIC WAVE CONVOLVERS Final Technical Report, 15 Oct. 1980 - 30 Dec. 1982
B. J. Hunsinger, R. L. Miller, and G. C. Pieters Hanscom AFB, Mass. RADC Oct. 1983 77 p
(Contract F19628-81-K-0031; AF Proj. 2305)
(AD-A135686; RADC-TR-83-111) Avail: NTIS HC A05/MF A01 CSCL 20/1

Line acoustic waves (LAW) are guided modes which follow the sharp edge of a crystal substrate. They offer non-dispersive propagation, tight acoustic energy confinement, and the availability of a signal pickup geometry which can be much more efficient than that of surface acoustic wave (SAW) beamwidth compressor devices. The objective of this program was to carry out theoretical and experimental investigation leading to wide bandwidth LAW transducers and to explore the feasibility of large time-bandwidth LAW convolvers. Broadband LAW generation was performed by converting SAWs to LAWs in multistrip mode converters (MSMCs). An MSMC having a bandwidth of 25% and conversion loss of 5 dB has been demonstrated. Theoretical comparisons between LAW and SAW convolvers indicate that the LAW convolvers should have significantly higher efficiency once they are fully developed. Fabrication of long, straight, chip-free edges was investigated. Improved techniques for cleaving crystals are described and significant progress toward a versatile new technique for sawing high quality edges is reported. Areas requiring additional work are identified and potential applications of LAW devices are discussed. Author (GRA)

N84-19057# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
ANALYSIS OF SOUND PRODUCED BY WIND TURBINES IN TURBULENT FLOW M.S. Thesis - MIT
Philippe Jean-Daniel Juvet Oct. 1983 114 p refs
(Contract NE-5061-016)
(FFA-TN-1983-44) Avail: NTIS HC A03/MF A01

An analytical method developed for helicopters and propellers was used to calculate the far field sound spectrum produced by the interaction of wind turbines with atmospheric turbulence. A linearized airfoil response to a two-dimensional gust was used to calculate the unsteady blade loading. The atmospheric turbulence model accounts empirically for anisotropy and inhomogeneity of the Earth's boundary layer. Results from a computer program developed for the method are presented. The calculated sound spectrum presents a region of peaks and valleys at low harmonics, due to blade to blade correlation, degenerating into a smooth spectrum at higher frequencies. The smooth part of the spectrum decays at 8 dB per octave. The wind turbine acoustic directivity is close to that of a dipole. Author (ESA)

N84-19058# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
THE EFFECT ON ACOUSTIC RADIATION OF MUTUAL INTERACTION BETWEEN A LINE VORTEX AND AN AIRFOIL M.S. Thesis - MIT, Cambridge
Ingemar Lindblad Oct. 1983 57 p refs
(Contract STU-81-4626B)
(FFA-TN-1983-45) Avail: NTIS HC A04/MF A01

A two dimensional model for the interaction, at high (subsonic) Mach numbers between a line vortex and the leading edge of a semi-infinite airfoil is developed. For a small vortex strength the flow region is shown to be noncompact. An approximate vortex path past the leading edge is calculated, assuming the vortex strength to be small but finite, using the Wiener-Hopf technique. The acoustic radiation is shown to be due, to lowest order, to unsteady loading on the airfoil, and vortex acceleration. Vortex acceleration is shown to give a small contribution to the total sound radiation for moderate Mach numbers. For Mach numbers close to unity, this effect is shown to give a significant contribution to the sound radiated upstream in the plane of the airfoil. Author (ESA)

N84-19059# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
ACOUSTIC RADIATION FROM A SEMIINFINITE ANNULAR DUCT IN A UNIFORM SUBSONIC MEAN FLOW
S. W. Rienstra 28 Dec. 1982 49 p refs Submitted for publication
(Contract NIVR-1773)
(NLR-MP-82045-U) Avail: NTIS HC A03/MF A01

Using a Wiener-Hopf approach, an analytical description is derived of the scattered field of a harmonic sound wave from an open ended annular duct submerged in a subsonic, coaxial, uniform mean flow. Explicit expressions are given for the acoustic power inside the pipe, in the acoustic far field, and, in the presence of vortex shedding, in the hydrodynamic far field and of the power absorbed by the vortex sheet. Acoustic power loss, due to vortex shedding from the trailing edge, at frequencies near cut-off was studied as a function of Mach number, mode number of the incident wave, and hub radius. Power loss increases with increasing Mach number, increasing hub radius and with decreasing frequency. The ratio of radiated and transmitted power becomes zero only in case of the plane wave. For the other modes this ratio tends to a finite value. Compared with the jet, the power loss in a uniform flow is much higher. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-19060# Wisconsin Univ., Madison. Mathematics Research Center.
THE MATHEMATICAL STRUCTURE OF ELEMENTARY PARTICLES
P. Nowosad Oct. 1983 126 p
(Contract DAAG29-80-C-0041)
(AD-A136295; MRC-TSR-2581) Avail: NTIS HC A07/MF A01 CSCL 12/1

This report consists of the first part of a general theory purporting to describe the mathematical structure of the elementary particles, starting from no preassumed knowledge, but deriving it instead from first principles along the line suggested by Dirac in the 1930's. In particular, quantum mechanics is shown to arise as a consequence of relativity theory and of the theory of generalized curves. In the first part the geometric structure (i.e., the nuclear field) is derived, and one obtains a slightly modified form of the Yukawa potential along with a cylindrical perturbation describing the spin effects. This report gives full details of the results announced in two previous reports. Author (GRA)

N84-19061# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.
STIMULATED CERENKOV-RAMAN SCATTERING Final Report
J. E. Walsh 14 Dec. 1983 157 p
(Contract N00014-79-C-0760)
(AD-A136473) Avail: NTIS HC A08/MF A01 CSCL 20/8

A Cerenkov-Raman Maser consists of an energetic electron beam, a dielectric resonator, and a static, rippled magnetic field

pump. In the absence of the dielectric resonator, the device is, at longer wavelengths, identical to a stimulated Raman source and at shorter wavelengths, identical to the free electron laser. The addition of the dielectric resonator to the device gives a further degree of freedom to the Doppler shift relations. Both modes can be used to form a Cerenkov-Raman maser. GRA

N84-19062# California Univ., Livermore. Lawrence Livermore Lab.
OPTIMIZED BAFFLE AND APERTURE PLACEMENT IN NEUTRAL BEAMLINES
Roger Stone, Tom Duffy, and Jan Vetrovec (TRW, Inc.) 23 Nov. 1983 6 p Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-003746; UCRL-89320; CONF-831203-31) Avail: NTIS HC A02/MF A01

Most neutral beamlines contain an iron-core ion-bending magnet that requires shielding between the end of the neutralizer and this magnet. This shielding allows the gas pressure to drop prior to the beam entering the magnet and therefore reduces beam losses in this drift region. The beam losses are reduced even further by eliminating the iron-core magnet and the magnetic shielding altogether. The required bending field is supplied by current coils without the iron poles. In addition, placement of the baffles and apertures affects the cold gas entering the plasma region and the losses in the neutral beam due to re-ionization. The placement of the baffles which, determine the amount of pumping in each chamber, and the apertures, which determine the beam loss were varied. A baffler/aperture configuration is for either minimum cold gas into the plasma region or minimum beam losses, but not both. DOE

N84-19063# Duke Univ., Durham, N. C.
SYSTEM FOR PRODUCING HIGH-RESOLUTION POLARIZED AND UNPOLARIZED BEAMS WITH A TANDEM ACCELERATOR
C. R. Westerfeldt, E. G. Bilpuch, M. E. Bleck, D. A. Outlaw, W. K. Wells, J. F. Wilkerson, and T. B. Clegg 1983 37 p refs Prepared in cooperation with Triangle Universities Nuclear Lab., Durham, N.C. and North Carolina Univ., Chapel Hill
(Contract DE-AS05-76ER-02408)
(DE84-004054; DOE/ER-02408/218; ORO-2408-218) Avail: NTIS HC A03/MF A01

A tandem accelerator beam energy stabilizer, which utilizes an optically coupled fast feedback loop to the accelerator terminal stripper, is described. Emphasis is placed on the components of the feedback system and on the application of this system to production of high energy resolution beams. This system produces beam energy spreads ranging from 450 to 600 eV FWHM for 2 to 16 MeV unpolarized protons. Polarized beam energy spreads range from 550 to 700 eV FWHM, for the same beam energy range. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-19064# Georgia Inst. of Tech., Atlanta.
DISSIPATIVE EFFECTS IN THE BEAM-BEAM INTERACTION OF INTERSECTING STORAGE RINGS Progress Report
1983 3 p refs
(Contract DE-AS05-81ER-40003)
(DE84-004871; DOE/ER-40003/2) Avail: NTIS HC A02/MF A01

A systematic analysis of the effects of dissipation in the beam-beam interaction was begun. Specifically, the case of cylindrically symmetric beams for which a global invariant of the motion exists was considered. This fact allows one to reduce the dimensionality of the system by two, and the original problem is converted into the study of a map of the plane into itself. DOE

74 OPTICS

Includes light phenomena.

N84-19065# Rochester Univ., N. Y. Inst. of Optics.
CHARACTERIZATION OF SCATTERING MEDIA USING NON-GAUSSIAN SPECKLE PATTERNS Final Technical Report, 14 Jul. 1980 - 30 Sep. 1983
J. C. Dainty 28 Nov. 1983 12 p
(Contract DAAG29-80-K-0048)
(AD-A136465; ARO-16864.11-PH; FTR-1) Avail: NTIS HC A02/MF A01 CSCL 20/6

The results of a research program on non-Gaussian speckle are summarized under six sub-headings: dynamic speckle, static non-Gaussian speckle, doubly scattered light, quasi-thermal light sources, detection of hidden gratings and space-time analysis camera. GRA

N84-19066# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
FABRY-PEROT INTERFERENCE FILTERS
R. W. F. Gross 1 Dec. 1983 14 p
(Contract F04701-83-C-0084)
(AD-A136511; TR-0084(4930-03)-1; SD-TR-83-71) Avail: NTIS HC A02/MF A01 CSCL 20/6

The discrimination of coherent, laser radiation from incoherent, white-light radiation can be accomplished with properly designed interference filters that make use of the coherent nature of laser radiation in addition to its narrow-band spectral character. In this study it is assumed that we wish to block high power laser radiation from a detector without impeding its ability to see light emitted by broad-band, incoherent, weak continuum sources. We analyze two types of Fabry-Perot, air spaced filters: (1) the tunable two or multiplate Fabry-Perot interferometer and (2) a multiplate stack of 1/4-wave plates. It is shown that the Fabry-Perot interferometer has a limited rejection ratio for coherent radiation, but offers the possibility of relatively large tuning range. By contrast, the rejection ratio for coherent radiation of quarter-wave plates can be made as large as 10000 with a white-light transmission of 20%, and a bandwidth delta lambda/lambda sub O = 0.03. However, the tuning range of such a stack will be limited. Author (GRA)

N84-19067# Air Force Weapons Lab., Kirtland AFB, N. Mex.
PHOTOACOUSTIC ABSORPTION SPECTROSCOPY (PAS) MEASUREMENTS Final Report, 1 Oct. 1981 - 1 Oct. 1983
Wayne Wasson Nov. 1983 15 p
(AF Proj. ILIR)
(AD-A136591; AFWL-TR-83-101) Avail: NTIS HC A02/MF A01 CSCL 20/6

A functioning optical component absorption measurement facility has been assembled to: (1) develop technical competency in evaluating the effectiveness of the technique, and (2) implement the technique as a routine measurement procedure for optical component evaluation. Both objectives have been partially successful. The conclusions of this research are that: (1) measurement accuracy is highly dependent on component selection and assembly; (2) many variables must be considered when using the technique; and (3) the technique has the capability to measure one of the many variables involved in photoacoustic absorption. The research and measurements are being transitioned into mission and support project work. GRA

N84-19068# Arizona Univ., Tucson. Dept. of Physics.
INFORMATION CONTENT AND SENSITIVITY OF MATRIX ELEMENTS TO STRUCTURAL CHANGES IN COMPLEX SCATTERING SYSTEM Progress Report, Sep. 1980 - Sep. 1982
William S. Bickel Aberdeen Proving Ground, Md. Army Armament Research and Development Command Jun. 1983 44 p
(Contract DAAK11-80-Q-0106)

(AD-A136600; ARCSL-CR-83027) Avail: NTIS HC A03/MF A01 CSCL 20/6

Physics Department researchers at the University of Arizona investigated a number of basic problems that are central to understanding light scattered from complex systems. They started with simple geometrical systems--spherical and cylindrical geometries with known optical constants that are directly amenable to theory. Theorists can calculate exactly every scattering property (the matrix elements) of these systems and experimentalists can measure them with arbitrarily high accuracy and precision. Yet some of the most basic questions about: (1) the information content in the various matrix elements, (2) their response to large and small changes in particle property, (3) their specificity to a particular parameter change, (4) the information density per scattering angle interval, and (5) ways to quantify changes, still needed careful study. The research was an optical study of fundamentals systems theoretically solvable and experimentally obtainable. The things learned from this study and described in this report will give insight to the matrix element data obtained from complex scattering systems. Author (GRA)

N84-19069# University of Southern California, Los Angeles. Center for Laser Studies.

CHARACTERISTICS OF AN INTEGRATED OPTICS RING RESONATOR Final Report, May 1979 - Jan. 1983

Elsa Garmire Aug. 1983 86 p

(Grant AF-AFOSR-0098-82; AF Proj. 2305)

(AD-A135878; AFOSR-83-1048TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

A ring resonator 4 cm in diameter was fabricated and tested for sensing applications. A finesse of four was measured, and agreed with measured coupling efficiency and losses. Techniques have been developed to reduce the loss and from our measurements we predict that a finesse of more than 20 should be easily achievable in an interferometer 4 cm in diameter. This device has a wide variety of applications from temperature and wavelength sensing to inertial rotation sensing. Further refinements which will produce a high finesse resonator are the fabrication of a single mode ring and using specially prepared optical glass substrates. Operation at wavelengths longer than 0.63 micron will also improve the performance. Author (GRA)

N84-19070# Army Engineer Topographic Labs., Fort Belvoir, Va.

THE RELATION BETWEEN ISOLATED TREE BRIGHTNESS TEMPERATURE AND GRASS BACKGROUND BRIGHTNESS TEMPERATURE

A. E. Krusinger Aug. 1983 37 p

(AD-A135843; ETL-R054) Avail: NTIS HC A03/MF A01 CSCL 17/5

This study involves thermal infrared measurement for the determination of the diurnal and seasonal aspects of the relations between isolated evergreen tress and a cut grass background and between a large truck brightness temperature and cut grass, uncut grass, and bare soil backgrounds. Seasonal changes in the tree brightness temperature-background brightness temperature contrast ranged from 4 to 5 C in February and March to 1 to 2 C in July. At night, the thermal contrast between trees and background was found to vary inversely with long wave incoming radiation, which is a measure of cloudiness. A study of the change in the thermal contrast during the night showed that, during clear weather, the contrast was at a peak a few hours after sundown and decreased the rest of the night. In overcast conditions, a reduced contrast peak occurred at sundown and very gradually diminished through the night. Isothermal conditions were found to occur in the early mornings, and the time of these occurrences changed seasonally, in a systematic manner. Author (GRA)

N84-19071# Electronics Engineering Group (1842nd), Scott AFB, Ill.

FEASIBILITY OF REMOTING BRITE 2 VIA FIBER OPTICS

30 Sep. 1983 8 p

(AD-A135858; Rept-1842-EEG-TR-83-18-EX) Avail: NTIS HC A02/MF A01 CSCL 20/6

This report is in response to tasking from EIC/EIW to determine the feasibility and method by which the BRITE 2 system could be remoted using fiber optics (FO). Research of the system technical order and measurements of the signal characteristics show the use of FO remoting is feasible. This report provides a recommended configuration for a FO remoting system. Author (GRA)

N84-19072# Geo-Centers, Inc., Newton, Mass.

INTRINSIC AND EXTRINSIC PROPERTIES OF FIBER OPTIC SENSOR MATERIALS

Sep. 1983 37 p

(Contract N00014-82-C-2326)

(AD-A135893; GC-TR-82-291) Avail: NTIS HC A03/MF A01 CSCL 20/6

The major sources of extrinsic absorption and scattering losses in fluorozirconate glasses and fibers have been identified. The origin of transition element impurities has been determined and a new separation process for their removal has been developed. A new reactive atmosphere process for reducing anion impurities is currently in use. Hydroxide contamination from atmospheric water has been recognized and glass processing and rod casting is being conducted in a specially designed atmosphere controlled glovebox. A recent modification will allow for the rotational casting of preforms within the glove box. Two processes suitable for preparing multimode preforms have been developed. Their applicability for single mode preforms, essential for long length repeaterless data transmission, appears promising. The extent of drawing induced scattering loss has been determined and its reduction can be expected with the use of atmosphere controlled RF furnace. Continued reduction in total extrinsic loss can be expected as these techniques and processes are totally integrated into the low loss fiber program. GRA

N84-19073# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

EXTENDED GAUSSIAN IMAGES

B. K. P. Horn Jul. 1983 44 p

(Contracts N00014-77-C-0389; N00014-80-C-0505)

(AD-A135747; AI-M-740) Avail: NTIS HC A03/MF A01 CSCL 20/6

This is a primer on extended Gaussian Images. Extended Gaussian Images are useful for representing the shapes of surfaces. They can be computed easily from: (1) needle maps obtained using photometric stereo, or (2) depth maps generated by ranging devices or stereo. Importantly, they can also be determined simply from geometric models of the objects. Extended Gaussian images can be of use in at least two of the tasks facing a machine vision system: (1) recognition, and (2) determining the attitude in space of an object. Here, the extended Gaussian image is defined and some of its properties discussed. An elaboration of non-convex objects is presented and several examples are shown. Author (GRA)

N84-19074# Harris-Intertype Corp., Melbourne, Fla. Government Systems Sector.

OPTICAL SIGNAL PROCESSING Final Report, 1 Oct. 1980 - 30 Sep. 1983

A. Vanderlugt 30 Nov. 1983 103 p

(Contract DAAG29-80-C-0149)

(AD-A135908; ARO-17614.7-PH) Avail: NTIS HC A06/MF A01 CSCL 20/6

An interferometric spectrum analyzer technique, using a distributed local oscillator, doubles the dyamic range of a conventional power spectrum analyzer (i.e., 60 dB vs. 30 dB), has an instantaneous analysis bandwidth of 200-1000 MHz, and is immune to scattered noise. An analysis of Bragg cell diffraction patterns shows that acoustic spreading leads to a curvature of the diffraction pattern along an elliptical or parabolic loci. Bounds on the size of integrating photodetector along the curved direction have been established based on frequency resolution criterion. This activity was extended to correct the acoustic spreading by using a holographic element. For a 12-channel Bragg cell operating over an 80 MHz bandwidth, the usable aperture was increased from

10% to 100%; the number of channels increased by a factor of four. An adaptive optical processing technique has been developed to overcome the bandwidth limitations of digital systems. These Bragg cells, used in an interferometer, provide the signal to be convolved as well as the tap weights. Extensive computer simulations of the performance of the system, given the finite integration times imposed by the Bragg cells, show that notch depths of 30-40 dB can be achieved for a system having at time-bandwidth product of 2000. Author (GRA)

N84-19075# Air Force Academy, Colo. Research Lab.
PRECISION MACHINING APPLICATION AND TECHNOLOGY: AN OVERVIEW AND PERSPECTIVE Progress Report, Sep. 1982 - Jul. 1983
Theodore T. Saito 24 Aug. 1983 11 p Presented at the 27th SPIE's Ann. Intern. Tech. Symp., n.p., 24 Aug. 1983
(AF Proj. 2305)
(AD-A135988; FJSRL-JR-83-0004) Avail: NTIS HC A02/MF A01 CSCL 20/6

After presenting a rule of thumb to evaluate the economical benefit of diamond turning compared to conventional polishing, applications of spinner mirrors, injection molding masters, and X-ray optics are discussed. Non-optical applications are included as well as precision grinding materials incompatible with diamond turning. GRA

N84-19076# Owens-Illinois Glass Co., Toledo, Ohio.
EVALUATION OF NRL GLASS FOR FIBER OPTICS, PHASE 2 Progress Report, Sep. 1979 - Dec. 1980
C. E. Schott 15 Jan. 1983 44 p
(Contract N00173-78-C-0242)
(AD-A136017) Avail: NTIS HC A03/MF A01 CSCL 11/2

This report covers a Phase 2 activity to develop glasses for medium loss fiber optic waveguides. The requirements of the final fiber are that it should have: a diameter of 75 to 125 micrometers with a 50 to 75 micrometers core; a numerical aperature of 0.4 to 0.6; losses of approximately 100 dB/km; and radiation resistance. The Phase 2 activities include the development of improved cladding and core glass composition, raw materials procurement an batch preparation of high purity materials, controlled atmosphere melting, preparation of perform assemblies, and fiber drawing. GRA

N84-19077# Hughes Research Labs., Malibu, Calif.
PHASE CONJUGATE OPTICAL RESONATOR Final Report, 15 Jan. 1980 - 14 Apr. 1983
R. A. McFarlane, R. C. Lind, G. J. Dunning, R. K. Jain, and J. F. Lam Nov. 1983 72 p
(Contract F49620-80-C-0041; AF Proj. 2301)
(AD-A136071; AFOSR-83-1093TR) Avail: NTIS HC A04/MF A01 CSCL 20/6

This is the Final report on a program to study the properties of phase conjugate optical resonators. Laser oscillation was achieved using both atomic sodium and photorefractive BaTiO3 in four-wave mixing geometry as a phase conjugate resonator. Spectral and transverse mode characteristics were measured. A self-pumped phase conjugate mirror was also used in an oscillator and a computer code developed to model power output and transverse mode profile. Aberration correction was demonstrated. Author (GRA)

N84-19078# California Inst. of Tech., Pasadena.
ACOUSTO-OPTIC PROCESSING OF 2-d SIGNALS USING TEMPORAL AND SPATIAL INTEGRATION Annual Report, 1 Apr. 1982 - 31 May 1983
D. Psaltis 31 May 1983 89 p
(Grant AF-AFOSR-0128-82; AF Proj. 2305)
(AD-A136086; AFOSR-83-1100TR) Avail: NTIS HC A05/MF A01 CSCL 20/6

Documents includes data on: Architectures; Coherence Properties of Pulsed Laser Diodes; Acousto-optic device data; Dynamic Range Issues; Image correlation; Synthetic aperture radar; 2-D Fourier transform; and Moments. GRA

N84-19079# Brookhaven National Lab., Upton, N. Y.
STORAGE RING DESIGN FOR X-RAY LITHOGRAPHY
A. vanSteenbergen and W. Grobman (IBM Watson Research Center) 1983 12 p refs Presented at the Advances in Soft X-ray Sci. and Technol. Conf., Upton, N.Y., 17-20 Oct. 1983
(Contract DE-AC02-76CH-00016)
(DE84-002859; BNL-33874; CONF-8310172-9) Avail: NTIS HC A02/MF A01

The design of an electron storage ring for Industrial X-ray Lithography is examined and a parameter optimization carried out based on a model lithography system in use at the National Synchrotron Light Source at Brookhaven National Laboratory. In this optimization the potential use of superconducting or permanent magnet Wigglers is considered. The basic parameters and geometry of a number of t(exposure) = 5 sec., lambda (operating) = 8.26 A devices are presented. DOE

N84-19080# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
TRANSVERSELY ANISOTROPIC OPTICAL FIBER: VARIATIOONAL ANALYSIS OF A NONSTANDARD EIGEN PROBLEM
Ismo V. Lindell and Markku I. Oksanen 1982 27 p refs Sponsored by the Academy of Finland
(Rept-S-133; ISBN-951-752-702-0) Avail: NTIS HC A03/MF A01

The variational principle for nonstandard eigenvalue problems is applied to guided wave propagation in an anisotropic dielectric waveguide. A stationary functional is derived for the general dielectric waveguide with transverse anisotropy. The functional is tested for an isotropic step index single mode fiber. For simple trial functions with only two parameters, good accuracy is obtained. For two types of transversely anisotropic step index fibers, relations between the propagation factor, anisotropy parameter, dielectric parameter and frequency are calculated. The functional does not assume weak guidance condition nor perturbational anisotropy and, hence, is also applicable for other dielectric waveguides. A small computer or a programmable calculator is adequate. The spurious modes causing confusion in the finite element method of calculation do not appear with the method. Author (ESA)

N84-19081# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
ASYMPTOTIC ANALYSIS OF WEAKLY GUIDING ANISOTROPIC OPTICAL FIBERS
Ismo V. Lindell and Markku I. Oksanen 1982 22 p refs Sponsored by the Academy of Finland
(Rept-S-136; ISBN-951-752-763-2; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

The asymptotic power series method is applied to wave propagation in a transversely anisotropic optical fiber. The dielectric waveguide structure may be arbitrarily inhomogeneous and anisotropic in the transverse plane. The dielectric tensor of the guide is assumed to be only slightly different from that of the surrounding material. It is shown that the asymptotic modes are solutions to a vector differential equation of Schrodinger type. The isotropic fiber has degenerate solutions and is more complicated to solve. The different asymptotic dependence of the birefringence in isotropic and anisotropic fibers is demonstrated. Isotropic and anisotropic fibers are studied by variational techniques, emphasizing anisotropic fibers whose solutions can be obtained from that of an isotropic fiber through parameter transformation. Author (ESA)

N84-19082# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
OPTICAL TIME-DOMAIN REFLECTOMETER PERFORMANCE AND CALIBRATION STUDIES
B. L. Danielson Jun. 1983 35 p refs Sponsored in part by Army Communications Research and Development Command
(PB84-110964; NBS-TN-1065) Avail: NTIS HC A03/MF A01 CSCL 20F

The measurement accuracy of the optical time-domain reflectometer (OTDR) is restricted in some applications by a limited operational dynamic range and by a lack of standardized test

procedures. In an effort to better understand these restrictions, the range of linearity of some avalanche photodiodes used as backscatter detectors were measured. Also, the effect of input launch conditions is examined and a possible standardized OTDR test procedure is proposed. Using these suggestions, comparisons were made between attenuation values determined by cutback and backscatter methods and good agreement is possible. Finally, some methods are described for checking the response linearity of OTDR systems. GRA

N84-18464# Sener, S.A., Madrid (Spain).
ACCURACY IN FOLDING MIRROR MECHANISM DISPLACEMENT LAW
E. Herrera *In* ESA First European Space Mech. and Tribilogy Symp. Dec. 1983 p 79-88 (For primary document see N84-18454 09-31)
Avail: NTIS HC A10/MF A01

N84-18804# Meteorological Satellite Center, Tokyo (Japan).
ON THE INFRA-RED BRIGHTNESS LEVEL INCREASE CAUSED BY THE SUN LIGHT DURING THE ECLIPSE PERIOD
Syuichi Katsuki *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 101-107 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

N84-19193*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RAPIDLY MOVING TELESCOPE: AN INSTRUMENT FOR THE PRECISE STUCY OF OPTICAL TRANSIENTS
B. J. Teegarden, T. T. vonRosenvinge, T. L. Cline, and R. Kaipa *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 7 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 20F

N84-19221# Observatoire de Strasbourg (France).
PREDICTION OF SPECTRAL CLASSIFICATION FROM PHOTOMETRIC DATA. APPLICATION TO THE MK SPECTRAL CLASSIFICATION AND THE GENEVA PHOTOMETRIC SYSTEM Progress Report
Daniel Egret and Andre Heck *In* ESA Statist. Methods in Astron. Nov. 1983 p 149-150 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

N84-19224# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
MEASUREMENTS IN THE PRESENCE OF NONWHITE NOISE
R. Papoular and B. Pegourie *In* ESA Statist. Methods in Astron. Nov. 1983 p 161-165 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-19083 British Library Lending Div., Boston Spa (England).
A PROCEDURE FOR INVESTIGATING THE COMPOSITION OF THE PLASMA ARC
V. F. Igushev, N. S. Zubkov, and M. Ya. Nagornyi [1983] 4 p ref Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Chern. Met. (USSR) p 157
(BLL-M-35454-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The equipment used to remove gases from plasma areas for investigation with a chromatograph is described. Argon and nitrogen, the plasma forming gases, were fed from cylinders through reducing valves, down gas lines to mixer, and then to the plasmotron. The rates of flow of the gases were regulated by the valves and recorded by rotary flow gases. Gas was removed for analysis through a water cooled copper slab with a 1.5 mm diameter aperture into glass aspirator flasks by developing a low vacuum. Before gas was taken for analysis, the gas piping was washed out with the gas to be investigated. The gas was then analyzed with a chromatograph. The nitrogen content of the arc scarcely varies over the cross section and the composition of the arc can therefore be measured at a single point. A.R.H.

N84-19084# New York Univ., New York.
RELATIVISTIC BROADENING NEAR CYCLOTRON RESONANCE
K. Imre and H. Weitzner Oct. 1983 45 p
(Contract DE-AC02-76ER-03077; Grant AF-AFOSR-0020-81; AF Proj. 2304)
(AD-A136224; MF-101; AFOSR-83-0992TR; DOE/ER-03077/198) Avail: NTIS HC A03/MF A01 CSCL 20/7

Relativistic broadening of absorption (or emission) lines near cyclotron resonance in a warm plasma is investigated using the linearized relativistic Vlasov-Maxwell system. The unperturbed state is assumed to be isotropic, but not necessarily Maxwellian. The expansion parameter is eta = v sub e/c, v sub e being the electron thermal speed. It is assumed that the wave frequency, plasma frequency, and cyclotron frequency are all comparable in magnitude, and the refractive index n = 0(1). The parameter alpha = eta/n is of arbitrary order, thus the results are uniformly valid for all values of oblique propagation angles, although the relativistic effects are negligible for alpha < 1. The dielectric tensor is reordered, and the dispersion relation appropriate for this problem is derived to the lowest significant order in eta. The results are expressed in terms of the readily calculable (generalized) plasma dispersion function-Z. In the Maxwellian case the results are alegbraic in Z, and unlike the previously published results, they do not involve infinite integrals or series imposed on Z, thus leading to simple and efficient evaluations. The case of perpendicular propagation is obtained by taking the large alpha limit. Some inconsistencies in the literature dealing with the extraordinary mode are resolved. Author (GRA)

N84-19085# Indiana Univ., Bloomington. Dept. of Chemistry.
A DETAILED CONSIDERATION OF RESONANCE RADIATION TRAPPING IN THE ARGON INDUCTIVELY COUPLED PLASMA Interim Technical Report
J. W. Mills and G. M. Hieftje 12 Dec. 1983 28 p Submitted for publication
(Contract N00014-76-C-0838; NR Proj. 051-622)
(AD-A136633; INDU/DC/GMH/TR-83-58; REPT-67) Avail: NTIS HC A03/MF A01 CSCL 07/4

The extent and duration of trapping of argon resonance radiation (106.7 nm and 104.8 nm) in the ICP was calculated using a model incorporating line shape contributions from both Doppler and pressure broadening. The trap was found to be at the pressure-broadened limit, giving an escape factor of 7.9 x 10 to the minus 4th power when excitation of the 4s states in the plasma annulus is assumed. Theoretical apparent radiative lifetimes Tau for argon 3 p 1 and 1 p 1 resonance states are calculated to be 8 microseconds and 1.9 microsecond respectively. The quartet of 4s states, rapidly mixed by electron collisions, are presumed to share an overall apparent radiative lifetime Tau app = 1.6 microseconds for the purpose of plasma modeling. Effects of this radiation trapping on the argon 4s atom density and on electron-ion recombination are discussed. GRA

N84-19086# Naval Research Lab., Washington, D. C.
NRL (NAVAL RESEARCH LABORATORY) PLASMA FORMULARY, REVISED
D. L. Book 1983 61 p
(AD-A135787; AD-E000552; NRL-MR-3332-Suppl) Avail: NTIS HC A04/MF A01 CSCL 20/9

Most of the formulas and data in this collection are well known and for all practical purposes are in the public domain. The books and articles cited are intended primarily not for the purpose of

giving credit to the original workers, but (1) to guide the reader to sources containing related material and (2) to indicate where derivations, explanations, examples, etc., omitted from this compilation can be found. Additional material can also be found in D.L. Book, NRL Memorandum Report 3332 (1977). GRA

N84-19087# Naval Research Lab., Washington, D. C.
STATUS OF LIGHT ION INERTIAL FUSION RESEARCH AT NRL (NAVAL RESEARCH LABORATORY) Interim Report
G. Cooperstein, P. F. Ottinger, S. A. Goldstein (JAYCOR, Alexandria, Va.), R. J. Barker, D. G. Colombant (JAYCOR, Alexanderia, Va.), R. A. Meger (Mission Research Corp., Alexandria, Va.), J. M. Neri (JAYCOR, Alexandria, Va.), D. Mosher (JAYCOR, Alexandria, Va.), F. L. Sandel, S. J. Stephanakis (JAYCOR, Alexandria, Va.) et al 30 Nov. 1983 27 p Presented at the 6th Intern. Workshop on Laser Interaction and Related Plasma Phenomena, 25-29 Oct. 1982, Monterey, Calif. Sponsored in part by DNA
(T99-QAXL)
(AD-A135951; DE84-004027; NRL-MR-5219) Avail: NTIS HC A03/MF A01 CSCL 20/7

High-brightness proton beams have recently been extracted from axial pinch-reflex diodes (PRD) mounted on the Gamble II generator. The source power brightness that was measured exceeded 10 TW/sq cm sq rad. Analysis of a modular inertial confinement fusion system using such diodes shows that an operational window for transport of light-ion species exists. Multi-terawatt beams can be transported a few meters in channels a few centimeters in diameter. A proof-of-principle experiment for the required final focusing cell has been successfully carried out on Gamble II. A new barrel-shaped equatorial PRD that can be coupled to PBFA II as a single diode has also been operated on Gamble II and has demonstrated 50% ion efficiency with predominantly azimuthally-symmetric charged-particle flow. Preliminary experiments using vacuum inductive storage and plasma opening switches have demonstrated factor-of-three pulse compressions, with corresponding power and voltage multiplications for pulse durations of interest to PBFA II. In other experiments the stopping power of deuterons in hot plasmas was measured. Results show about 40% enhancement in stopping power over that in cold targets when the deuteron beam is focused on the target to about 0.25 MA/sq cm. Author (GRA)

N84-19088# Florida Univ., Gainesville. Dept. of Chemistry.
ATOMIC AND MOLECULAR GAS PHASE SPECTROMETRY Final Scientific Report, 1 Oct. 1979 - 30 Sep. 1983
J. D. Winefordner 30 Sep. 1983 53 p
(Contract F49620-80-C-0005; AF Proj. 2303)
(AD-A135971; AFOSR-83-1101TR) Avail: NTIS HC A04/MF A01 CSCL 21/2

The major goals of this research have been to develop diagnostical spectroscopic methods for measuring spatial/temporal temperatures of combustion flames and plasmas and to develop sensitive, selective, precise, reliable, rapid spectrometric methods of trace analysis of elements present in jet engine lubricating oils, matellurgical samples, biological materials, and automobile and other engine exhausts. The diagnostical approaches have been based upon the measurement of pulsed laser excited fluorescence of seeds, such as In, T1, Pb, etc., introduced into the flames, plasmas, or hot gases or in the case of flames, the measurement of natural flame species as OH. Because of the excellent fluorescence signal to noise ratios, it has been possible to measure temperatures of combustion flames for volumes smaller than 1 cu mm and for single laser pulses of a few nanoseconds. The technique with the most promise for use in combustion flames and in reactors is based upon thermally assisted fluorescence of an externally introduced seed as T1 and In or of an internal species as OH. By exciting the species with a dye laser and measuring the fluorescence from energy levels thermally excited form the laser excited state, the flame (plasma) temperature can be readily measured (+ or - 10 C) for a volume < 1 mm 3 and for a single laser pulse. GRA

N84-19089# Oak Ridge National Lab., Tenn.
ATF-1 TORSATRON STUDIES
J. F. Lyon, B. A. Carreras, L. A. Charlton, W. A. Cooper, R. A. Dory, R. H. Fowler, L. Garcia, J. H. Harris, T. C. Hender, H. R. Hicks et al 1983 5 p refs Presented at the 11th European Conf. on Controlled Fusion and Plasma Phys., Aachen, 5 Sep. 1983
(Contract W-7405-eng-26)
(DE84-003314; CONF-830908-8) Avail: NTIS HC A02/MF A01

The main advances in the ORNL Stellarator Program since the 1982 IAEA Conference were: (1) engineering design of the ATF-1 torsatron; (2) extension of 3-D MHD equilibrium and stability studies and calculations of helical axis configurations; (3) study of stable equilibria with < beta > greater than or equal to 8% and direct access to the second stability regime; (4) 3-D Monte Carlo and analytic transport calculations which show a large reduction in transport at low collisionality for the absolute value of e phi prime/Tprime greater than or equal to 1; (5) calculation of ambipolar electric fields; and (6) calculation of well confined ion drift surfaces in the ergodic field region outside the last closed flux surface. DOE

N84-19090# California Univ., Livermore. Lawrence Livermore Lab.
MICROWAVE INTERFEROMETER USING 94-GHz SOLID-STATE SOURCES
F. E. Coffield, S. R. Thomas, D. D. Lang, and R. D. Stever 14 Nov. 1983 6 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-003741; UCRL-89244; CONF-831203-29) Avail: NTIS HC A02/MF A01

A 94-GHz microwave interferometer was designed for the Tandem Mirror Experiment Upgrade and the Mirror Fusion Test Facility to replace the 140-GHz system. The new system is smaller and has modular single channel units designed for high reliability. It is magnetically shielded and is mounted close to the machine, which allows the use of lower power solid-state sources. Test results of the 94-GHz prototype indicate that the phase resolution is better than 10, the Impatt FM noise is 5 MHz wide, and the Gunn FM noise is 6 kHz wide. The antenna designs along with the test results are presented and the unique problems associated with diagnosing a high electron temperature plasma in the presence of electron cyclotron resonant heating are discussed. DOE

N84-19091# Oak Ridge National Lab., Tenn. Fusion Energy Div.
PROCEEDINGS OF THE ADVANCED BUMPY TORUS CONCEPTS WORKSHOP
N. A. Uckan, ed. Oct. 1983 427 p refs Workshop held in Rancho Santa Fe, Calif., 11-13 Jul. 1983 Prepared in cooperation with Applied Microwave Plasma Concepts, Inc., Encinitas, Calif.
(Contract W-7405-eng-26)
(DE84-002406; CONF-830758) Avail: NTIS HC A19/MF A01

Separate abstracts were prepared for 24 of the included papers in the following topics: closed field line devices, closed flux surfice devices, and electric field enhanced confinement. Also covered were: EBT microwave depositing, and electric field. B.G.

N84-19092# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering.
ICRF WAVEGUIDE COUPLERS Progress Report, Feb. - Aug. 1983
J. E. Scharer Aug. 1983 15 p refs
(Contract DE-AC02-83ER-52090)
(DE84-004042; DOE/ER-52090/1) Avail: NTIS HC A02/MF A01

Calculations were made for the reflection coefficient from a dielectric loaded TE10 waveguide operating at 54.8 MHz to a tokamak plasma with a prescribed density profile. Optimum waveguide proportions are determined to minimize reflections and the proper match point for a coaxial feed to match the system is determined. DOE

N84-19093# Texas Univ., Austin. Inst. for Fusion Studies.
PARTICLE SIMULATION OF DRIFT WAVES IN A SHEARED MAGNETIC FIELD
R. D. Sydora, J. N. Leboeuf, and T. Tajima Nov. 1983 54 p refs
(Grants DE-FG05-80ET-53088; NSF ATM-82-14730)
(DE84-004026; DOE/ET-53088/119) Avail: NTIS HC A04/MF A01

Electrostatic properties of density gradient drift waves (the universal mode), in a sheared magnetic field, are studied using a two-and-one-half dimensional particle code. For the case of a single rational surface, the drift waves are found to be stable with an eigenmode structure that matches the linear theoretical prediction as long as the ion resonance point is well within the system. This applies to both even and odd parity modes with respect to the rational surface. The dependence on various parameters such as the shear length is examined. DOE

N84-19094# Los Alamos Scientific Lab., N. Mex.
ANOMALOUS RESISTIVITY AT THE FIELD NULL OF THE FRC: A QUASI-LINEAR EXPRESSION BASED UPON FLUTE-TYPE MODES
Richard Gerwin Oct. 1983 14 p
(Contract W-7405-eng-36)
(DE84-003556; LA-9892-MS) Avail: NTIS HC A02/MF A01

In the Field-Reversed Theta Pinch (FRC) experiment, the poloidal flux is observed to be lost at a rate several times greater than classical resistivity would allow. Thus, there must be anomalous resistivity at the field null. Assuming that an electromagnetic microinstability of the flute mode type is responsible for this, a general expression for the anomalous resistivity at the field null based upon a quasi-linear model of the microturbulence was derived. This general expression does not depend upon the details of the ion-species model, for example, whether the ions are fluid or kinetic. DOE

N84-19191*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EQUILIBRIA IN STRONGLY MAGNETIZED PAIR PLASMAS
Alice K. Harding *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 4 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 20I

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-19095 British Library Lending Div., Boston Spa (England).
MAGNETIC PROPERTIES OF INTERSTITIAL PHASES IN VANADIUM-OXYGEN SYSTEM
V. O. Volnov, A. F. Shevakin, N. T. Bugaichuk, and B. V. Khaenko [1983] 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb, Zaved. Chern. Met. (USSR), no. 3, 1983 p 83-85
(BLL-M-35386) Avail: British Library Lending Div., Boston Spa, Engl.

The electron structure in vanadium-oxygen alloys with low oxygen concentrations was studied. The time of relaxation and the Knight shift on V(51) nuclei in the V-O syatem were studied by nuclear magnetic resonance with the oxygen concentration ranging from 0 to 33 at -%. Author

N84-19096*# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
OHMIC CONTACTS, IRRADIATION EFFECTS, AND THIN FILM GROWTH OF GaAs AND Al SUB 1-x Ga SUB x As Final Technical Report
Paul H. Holloway 31 Jan. 1984 62 p refs
(Grant NAG1-154)
(NASA-CR-173257; NAS 1.26:173257) Avail: NTIS HC A04/MF A01 CSCL 20L

The effects of interfacial chemistry on the electrical properties of metal contacts to gallium arsenides and aluminum gallium arsenides are determined. For individual titles, see N84-19097 through N84-19100.

N84-19097*# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
OHMIC VERSUS RECTIFYING CONTACTS OF Au TO n-GaAs BY ION SPUTTERING
Y.-X. Wang (Academy of Sciences, Beijing, China), Paul H. Holloway, W. L. Wang, and S. S. Li *In its* Ohmic Contacts, Irradiation Effects, and Thin Film Growth of GaAs and Al sub 1-x Ga sub x As 31 Jan. 1984 10 p refs (For primary document see N84-19096 09-76)
(Grant DAAG29-84-K-0003)
Avail: NTIS HC A04/MF A01 CSCL 20L

Results of investigations of argon ion sputtering of heavily doped n-GaAs are compared with those obtained from studies of Au/low doping density n-GaAs contacts. The Au contact on Si-doped GaAs was nearly ohmic when the surface contamination (carbon and oxides) was reduced prior to deposition by chemical cleaning. However, when ion sputtering was used in situ to clean the surface, rectifying contact was produced whose barrier height varied with the energy of the sputtering ion. It was found that ion sputtering of GaAs doped to more than 3 x 10 to the 18th power/cu may be used to change ohmic contact to rectifying contacts. The barrier height may be changed by changing the ion energy. The behavior results from the sputter creation of deep level acceptor states at the GaAs surface. Annealing after sputtering can restore the contact to nearly an ohmic character. A.R.H.

N84-19098*# Florida Univ., Gainesville. Major Analytical Instrumentation Center.
MAGNETRON SPUTTERED GOLD CONTACTS ON n-GaAs
A. D. Buonaquisti, R. J. Matson (Midwest Research Inc., Golden, Colo.), P. E. Russell (JEOL USA, Inc., Peabody, Mass.), and Paul H. Holloway *In its* Ohmic Contacts, Irradiation Effects, and Thin Film Growth of GaAs and Al sub 1-x Ga sub x As 31 Jan. 1984 11 p refs (For primary document see N84-19096 09-76)
Avail: NTIS HC A04/MF A01 CSCL 20L

Direct current planar magnetron sputtering was used to deposit gold Schottky barrier electrical contacts on n-type GaAs of varying doping densities. The electrical character of the contact was determined from current voltage and electron beam induced voltage data. Without reducing the surface concentration of carbon and oxide, the contacts were found to be rectifying. There is evidence that energetic neutral particles reflected from the magnetron target strike the GaAs and cause interfacial damage similar to that observed for ion sputtering. Particle irradiation of the surface during contact deposition is discussed. A.R.H.

N84-19099*# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
EFFECT OF ION SPUTTERING ON THE INTERFACE CHEMISTRY AND ELECTRICAL PROPERTIES OF Au/n-GaAs (100) SCHOTTKY CONTACTS
Y.-X. Wang (Academy of Sciences, Beijing, China) and Paul H. Holloway *In its* Ohmic Contacts, Irradiation Effects, and Thin Film Growth of GaAs and Al sub 1-x Ga sub x As 31 Jan. 1984 8 p refs (For primary document see N84-19096 09-76)
Avail: NTIS HC A04/MF A01 CSCL 20L

Interface sputter damage effects were measured for Sn-doped (approximately 2x10 to the 17th power/cu cm) [100] oriented GaAs. The sputter surfaces were characterized by Auger and X-ray photoelectron spectroscopy. Gold contacts were then deposited in situ on these characterized surfaces. Results of I-V and C-V measurements are shown in graphs. A.R.H.

N84-19100*# Florida Univ., Gainesville. Dept. of Materials Science and Engineering.
EFFECT OF ION SPUTTERING ON INTERFACE CHEMISTRY

AND ELECTRICAL PROPERTIES OF AN GaAs (100) SCHOTTKY CONTACTS
Y.-X. Wang (Academy of Sciences, Beijing, China) and Paul H. Holloway *In its* Ohmic Contacts, Irradiation Effects, and Thin Film Growth of GaAs and Al sub 1-x Ga sub x As 31 Jan. 1984 30 p refs (For primary document see N84-19096 09-76)
(Grant DAAG29-84-K-0003)
Avail: NTIS HC A04/MF A01 CSCL 20L

Auger and electron photoelectron spectroscopy were used to measure the extent of As depletion during 1 keV to 5 keV argon sputtering of GaAs surfaces. This depletion was correlated with a general decrease in the barrier height of the rectifying Au contact deposited in situ. However, nondestructive angle resolved XPS measurements showed As was depleted at the outer surface more by 1 keV than 3 keV argon. These effects are explained based on a combined work effective work function model and creation of a donor like surface damage layer. The donor layer was correlated with As depletion by sputtering. Deep level trap formation and annealing of sputtering effects were studied. Author

N84-19101# National Aerospace Lab., Tokyo (Japan).
SCATTERING DISTRIBUTION CHARACTERISTICS OF RARE GASES REFLECTED FROM METAL SURFACE WITH ABSORBED GAS MOLECULES
Akira Onji and Shoichi Tsuda 1983 13 p refs In JAPANESE; ENGLISH summary
(NAL-TR-761; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Reflected intensity distributions of neon, argon and krypton from planes of silver, nickel and platinum were measured at incident energies ranging from 0.06 to 3.8 eV. The surfaces of these metals were assumed to be contaminated by absorbed molecules as no effort was made to remove them. Lobular patterns were obtained for nickel and platinum planes when the incident energies exceeded 1.0 eV. For silver planes, the distribution pattern was always lobular even when the incident energies were low. For these lobular distributions, the behavior of two characteristics, delta theta, the deviation of the angle of the maximum flux from the specular direction and lambda, the width at half height, was studied and compared with existing results obtained from clean surfaces. With the presence of adsorbed molecules, distribution profiles compared with those of clean surfaces become broader and the direction of the maximum flux moves towards the surface normal. From precise studies of the characteristics, it could be concluded that, in the scattering, the adsorbed layer works to reduce the incident energies and raise the surface temperature by absorbing the incident energies. When the incident energies become high, sputtering of adsorbed molecules begins to occur and the measured patterns gradually approach those of clean surfaces. S.L.

N84-19102# Stanford Univ., Calif. Center for Materials Research.
RESEARCH AND CRYSTAL GROWTH ON HIGH DIELECTRIC CONSTANT MATERIALS FOR MM WAVE APPLICATIONS Semiannual Technical Report
R. S. Fiegelson and D. Elwell Nov. 1983 13 p
(Contract N00014-82-K-0266)
(AD-A136281; CMR-83-11) Avail: NTIS HC A02/MF A01 CSCL 20/12

The primary objectives of this program are to grow high-quality single crystals of materials which are candidates for electro-optic phase shifters at mm wavebands. The materials initially selected were the ferroelectric fluorides with the tetragonal SrAlF5 structure, BaxSr1-xTiO3 solid solutions, and CdIn2Te4. GRA

N84-19103# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
X-RAY TOPOGRAPHIC MEASUREMENTS OF STRAIN FIELDS Ph.D. Thesis
S. R. Stock (Northwestern Univ., Evanston, Ill.), Haydn Chen, and H. K. Birnbaum Aug. 1983 11 p
(Contracts N00014-83-K-0468; N00014-75-C-1012)
(AD-A136310) Avail: NTIS HC A02/MF A01 CSCL 20/2

This report describes a new technique which allows the determination of strain components in solids with a spatial resolution of about 10 micrometers. The method uses X-ray topography and may be applied to specimens which have relatively high dislocation contents. The technique may be used for thin specimens as well as relatively thick ones. Author (GRA)

N84-19104# Barr and Stroud Ltd., Glasgow (Scotland).
PREPARATION OF A PROFILED FILM OF DIAMOND-LIKE CARBON ON GERMANIUM SUBSTRATES Final Scientific Report, 1 Jun. - 9 Aug. 1983
J. S. Orr Nov. 1983 13 p
(Contract F49620-83-C-0112; AF Proj. 2301)
(AD-A136314; EOARD-TR-84-05) Avail: NTIS HC A02/MF A01 CSCL 20/12

The objective of this contract was to prepare a profiled film of the Barr and Stroud diamond-like carbon coatings on germanium substrates. This report describes the techniques used to prepare the films and the results of optical measurements. The samples have been supplied to the US Government for further optical and environmental analysis. GRA

N84-19105# Boston Univ., Mass. Dept. of Chemistry.
ELECTRON DONOR-ACCEPTOR QUENCHING AND PHOTOINDUCED ELECTRON TRANSFER FOR COUMARIN DYES Technical Report, 1 Jan. - 31 Oct. 1982
Guilford Jones, II, Susan F. Griffin, Choi-yoo Choi, and William R. Bergmark 31 Oct. 1983 21 p Submitted for publication
(Contract N00014-79-C-0054; NR Proj. 395-609)
(AD-A136345; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/5

The fluorescence of 7-aminocoumarins is quenched by a variety of organic electron donors or acceptors in acetonitrile. In general, donors with half-wave oxidation potentials less positive than 1.0 V vs SCE and acceptors with reduction potentials less negative than -1.5 V vs SCE are candidates for diffusion limited quenching of coumarin singlet states. Profiles of quenching rates are consistent with calculated free energies for electron transfer between excited coumarins and donors or acceptors. In flash photolysis experiments electron transfer for several dyes and quenchers (e.g., methyl viologen) is demonstrated. Relatively low yields of net electron transfer are consistently obtained due to inefficient ionic photodissociation via singlet quenching or a low yield of more photoactive coumarin triplets. Electrochemical properties of the coumarins have been investigated by cyclic voltammetry with the indications of reversible oxidation and irreversible reduction as important processes. Author (GRA)

N84-19106# Wisconsin Univ., Madison. Mathematics Research Center.
A NONLINEAR EIGENVALUE PROBLEM MODELLING THE AVALANCHE EFFECT IN SEMICONDUCTOR DIODES
Peter A. Markowich (Technische Univ., Vienna) Nov. 1983 26 p
(Contract DAAG29-80-C-0041)
(AD-A136368; MRC-TSR-2595) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is concerned with the analysis of the solution set of the two-point boundary value problems modelling the avalanche effect in semiconductor diodes for negative applied voltage. We interpret the avalanche-model as a nonlinear eigenvalue problem (with the current as eigen parameter) and show (using a priori estimates and a well known theorem on the structure of solution sets of nonlinear eigenvalue problems for compact operators) that there exists an unbounded continuum of solutions which contains a solution corresponding to every negative voltage. This effect (also called avalanche generation) is characterized by a sudden increase of the current flowing through the device starting at a certain negative voltage. Physically, the diode breaks down shortly after the onset of avalanche generation. Therefore, it was conjectured that there is a threshold voltage beyond which no solutions of the avalanche model exists. We show that this conjecture is false; more precisely a continuous branch of solution along which every negative voltage and every negative bias is assumed (at least once) exists. Mathematically, the avalanche-effect only becomes apparent through an exponential increase of

the absolute value of the current starting at a certain negative voltage. GRA

N84-19107# Wisconsin Univ., Madison. Mathematics Research Center.
THE CAUCHY AND BORN HYPOTHESES FOR CRYSTALS
J. L. Ericksen (Minnesota Univ., Minneapolis) Nov. 1983 18 p
(Contract DAAG29-80-C-0041; Grant NSF MEA-79-11255)
(AD-A136374; MRC-TSR-2591) Avail: NTIS HC A02/MF A01 CSCL 12/1

Commonly, hypotheses introduced by Cauchy or Born are used to relate macroscopic deformation to atomic motions, in molecular theories of elasticity. Our purpose is to discuss the applicability of these to crystal-crystal phase transformations and the ambiguities which are involved in estimating the deformation from observations of lattice vectors. Author (GRA)

N84-19108# North Carolina Univ., Chapel Hill.
A STUDY OF PHASE TRANSITIONS Final Report
I. Lefkowitz 25 Nov. 1983 49 p
(Contract DAAG29-79-D-1002)
(AD-A136449; ARO-17014.2-PH) Avail: NTIS HC A03/MF A01 CSCL 20/12

The diamagnetic transition in CuCl has been verified, and materials studies have been carried out to determine the conditions under which this transition, which may per precursive to high temperature superconductivity, may be found. A photoactivated, defect induced dielectric anomaly has been detected in CuCl, and the relationship of the anomalies to the superdiamagnetism has been explored. Equilibrium measurements of superdiamagnetism and the diamagnetic transition on samples of CuCl epitaxially grown on single crystals of silicon have been carried out. GRA

N84-19109# Air Force Weapons Lab., Kirtland AFB, N. Mex.
THE PHYSICS OF SECOND BREAKDOWN Final Technical Report, 29 Oct. 1982 - 30 Sep. 1983
Mark E. Snyder Nov. 1983 50 p
(AF Proj. 3763)
(AD-A136537; AFWL-TR-83-22) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report details the phenomenology of second breakdown in semiconductor materials. This phenomenology is then investigated and explained in the light of solid state physics and known experimental results. The similarity between second breakdown and current controlled negative resistance is shown to lead to the conclusion that current and thermal mode breakdown is explained by plasma injection. Author (GRA)

N84-19110# Sperry Research Center, Sudbury, Mass.
TUNNELING THROUGH AMORPHOUS SILICON BARRIERS Final Report, Jul. 1982 - Aug. 1983
H. Kroger, L. N. Smith, D. W. Jillie, and J. B. Thaxter Oct. 1983 31 p
(Contract N00014-82-C-0525)
(AD-A135866; SRC-CR-83-37) Avail: NTIS HC A03/MF A01 CSCL 20/12

Substantial evidence has been accumulated during the course of this program which indicates that the localized states which are present in nonhydrogenated sputtered amorphous silicon barriers contribute to the larger current density observed at biases below the superconducting energy gap of the electrodes. The basic observations and the method of measuring the density of localized states at the Fermi level of the barrier materials are presented in the Appendix which is a reprint of a paper presented at the 1982 Superconductivity Conference. More recent observations and theoretical speculations are included in this report. GRA

N84-19111# Rockwell International Corp., Anaheim, Calif. Microelectronics Research and Development Center.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF HETEROJUNCTION INTERFACES Final Report, 1 Sep. 1976 - 30 Jun. 1983
E. A. Kraut, R. W. Grant, J. R. Waldrop, and S. P. Kowalczyk Nov. 1983 72 p
(Contract N00014-76-C-1109)
(AD-A135896; MRDC41099.1FR) Avail: NTIS HC A04/MF A01 CSCL 20/12

A technique based on the use of X-ray photoelectron spectroscopy was developed to measure heterojunction band discontinuities with an uncertainty of + or - 0.04 eV and changes in band discontinuities for a specific heterojunction interface with an uncertainty of + or - 0.01 eV. This technique was used to investigate Ge-GaAs, GaAs-AlAs, ZnSe-GaAs, and ZnSe-Ge heterojunctions. It was discovered that microscopic dipoles present at abrupt heterojunction interfaces can substantially affect observed band discontinuities. Variations in heterojunction band discontinuities as functions of crystallographic orientation, growth sequence, and growth conditions were observed. It was established that heterojunction band discontinuities depend on microscopic properties of the interface and cannot be predicted from individual semiconductor properties alone. Based on electrostatic considerations, it was shown that polar heterojunction interfaces cannot be atomically abrupt but must require at least two interfacial transition planes to be consistent with experimental observations. GRA

N84-19112# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
PICOSECOND LASER PULSE INTERACTIONS WITH METALLIC AND SEMICONDUCTOR SURFACES Annual Progress Report, 1 Nov. 1982 - 31 Oct. 1983
N. Bloembergen and F. Spaepen 1 Nov. 1983 63 p
(Contract N00014-83-K-0030)
(AD-A135693; APR-1) Avail: NTIS HC A04/MF A01 CSCL 20/12

Picosecond heating and cooling experiments on silicon surfaces are reported. The surfaces are probed by a picosecond pulse, following the heating pulse, as a function of wave length, time delay and energy fluence. Picosecond laser-induced transformations of modulated metal films extend the glass formation range. New glassy alloys have been formed. GRA

N84-19113# Florida Univ., Gainesville. Dept. of Chemical Engineering.
A COMPARATIVE THERMODYNAMIC ANALYSIS OF IMPURITY INCORPORATION IN VAPOR PHASE EPITAXIAL InP AND GaAs Final Scientific Report, 15 Mar. 1981 - 14 Aug. 1982
T. J. Anderson and D. Meyer 31 Oct. 1983 219 p Presented at Natl. AIChE Conf., Orlando, Fla., Mar. 1982 and Am. Vac. Sci. Conf., Anaheim, Calif., Apr. 1983
(Grant AF-AFOSR-0164-81; AF Proj. 2306)
(AD-A135739; AFOSR-83-1108TR) Avail: NTIS HC A10/MF A01 CSCL 20/12

The maximum extent of unintentional Si incorporation has been defined for deposition of GaAs and InP by both the chloride and hydride processes. The extents were determined on the basis of constrained chemical equilibrium being achieved in the CVD reactor. The input species consisted of the input gas components and excess condensed phases of the group 3 source material and quartz reactor wall. The work performed included incorporation of a novel psuedo-steady state constraint for the liquid source, identifying vapor species not included before, and establishing the vapor composition relation to the point defect structure. The results indicate that Si incorporation levels can be significant. In general, the activity of Si was less in the hydride system and with the compound source in the chloride system. Furthermore, the activity of Si decreased significantly with temperature, small additions of H2O, HCl or VCl3 to the mixing zone, and replacing the H2 carrier gas by an inert in the chloride system. However, the activity of Si displayed a maximum with system pressure and was somewhat insensitive to input composition. Reviews of the literature are included for the thermochemical properties employed and unintentional doping in experimental GaAs and InP VPE films. Algorithms for computing complex chemical equilibrium using both stoichiometric and non-stoichiometric approaches were generated. GRA

N84-19114# Crystacomm, Inc., Mountain View, Calif.
DEVELOPMENT OF HIGH PURITY Ip CRYSTALS Final Report, Sep. 1982 - Sep. 1983
G. A. Antypas Sep. 1983 14 p
(Contract N00014-82-C-2372)
(AD-A135937) Avail: NTIS HC A02/MF A01 CSCL 20/12

Large diameter, 1 kg in weight, high purity polycrystalline and (100) oriented InP single crystals can be routinely prepared, with background carrier concentrations of 2-4x10 to the 15th power/cc and room temperature mobilities in excess of 4000 sq cm/v-sec. The large diameter (Approx. 3 in.), (100) oriented undoped single crystals have unusually low dislocation densities. Sulfur doped crystals are practically dislocation free. GRA

N84-19115# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
EXCITONIC SOLIDS Final Report
R. K. MacCrone 3 Nov. 1983 58 p
(Grant AF-AFOSR-0126-79; AF Proj. 2301)
(AD-A135972; AFOSR-83-0997TR) Avail: NTIS HC A04/MF A01 CSCL 20/12

The investigators have made experimental measurements of the diamagnetism of CdS and have attempted to understand the anomolous effects by theoretical analysis. These studies have contributed to understanding the contribution of impurities to the anomalous diamagnetism in CdS. GRA

N84-19116# IBM Research Lab., San Jose, Calif.
THERMAL DIFFUSIVITY IN THIN FILMS MEASURED BY NONCONTACT SINGLE-ENDED PULSED-LASER-INDUCED THERMAL RADIOMETRY
Andrew C. Tam and Wing P. Leung (Chinese Univ. of Hong Kong) 22 Nov. 1983 21 p
(Contract N00014-83-C-0170; NR Proj. 633-844)
(AD-A135991; TR-5) Avail: NTIS HC A02/MF A01 CSCL 20/12

A pulsed nitrogen laser is used to induce a sharp thermal gradient in a thin film, and the thermal radiation (infrared) transient from the irradiated region is monitored from the same side as the excitation beam (i.e., single-ended detection). We show that this pulsed photothermal radiometry lineshape can be analyzed to provide the thermal diffusivity or thickness of the sample, as well as information on subsurface modifications or the degree of thermal contact with a substrate. We present data for several important classes of films, including metal, polymer and paper (e.g., in currency) and show the important features of the present technique for thin-film characterization, namely nondestructive, fast and remote sensing. Author (GRA)

N84-19117# Stanford Univ., Calif.
INVESTIGATION OF METALLIC IMPURITIES INTRODUCED INTO SIO/SUB 2 Midterm Technical Progress Report, 1 Sep. 1982 - 31 Sep. 1983
R. M. Swanson and T. W. Sigmon 31 Sep. 1983 73 p
(Contract MDA903-82-K-0412; DARPA Order 4541)
(AD-A136008) Avail: NTIS HC A04/MF A01 CSCL 20/12

This report contains the theoretical development of a model that describes the diffusion of interstitial diffusors in SiO2. Experimental data supporting this model and the implications and conclusions predicted by this model are presented. In summary this model concludes that Pd, Au, Ta, W, Pt, Ti, and Al are potential candidates for use in VLSI gate metalization schemes, where as Ag, Cu, Na, Ni, Mn, Fe, Mg, and Ga are unsuitable. GRA

N84-19118# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CRITICAL CURRENT OF THE DISPERSION SUPERCONDUCTING PHASE, OBTAINED DURING AGING
Y. P. Romanov, L. V. Smirnov, V. D. Sadovskiy, and N. V. Volkenshteyn 1 Dec. 1983 10 p Transl. into ENGLISH from Fizika Met. Metaloved. (USSR), v. 20, no. 3, Sep. 1965 p 455-458
(AD-A136024; FTD-ID(RS)T-1334-83) Avail: NTIS HC A02/MF A01 CSCL 20/12

High critical parameters of plastic superconductos on a based of solid solutions and obtained as a result of plastic deformation and heat treatment. At the same time, the critical current and field of monocrystalline samples turn out to be significantly lower. The preservation of superconducting in high magnetic fields is conditioned by the presence of a dense network of very thin intersecting filaments, which remain superconducting during the conversion of the main mass of the material into the normal state with the help of an electron microscope a lamellar threddike structure was determined which was which was conditioned by plastic deformation and the breakdown of a solid solution. B.G.

N84-19119# Lehigh Univ., Bethlehem, Pa.
FUNDAMENTAL RADIATION DAMAGE PROCESSES IN SILICON Final Report
25 Oct. 1983 15 p
(Contract N00014-76-C-1097)
(AD-A136033) Avail: NTIS HC A02/MF A01 CSCL 20/12

This program has been aimed at detemining and understanding the fundamental properties of simple lattice point defects in semiconductors. The specific purpose has been to determine the electronic properties of the defects, to understand the mechanisms by which they are formed or incorporated into the lattice, and to probe the processes by which they can migrate through the lattice and react with other defects to form complexes. The major emphasis has centered on silicon. As the simplest and best understood semiconductor, silicon provides the best hope of clean, unambiguous and generally applicable answers to these questions. GRA

N84-19120# New Univ. of Ulster, Coleraine (Northern Ireland).
METAL CONTACTS IN SEMICONDUCTORS Final Technical Report, Sep. 1980 - Sep. 1983
R. H. Williams and M. H. Patterson Nov. 1983 125 p
(Contract DAJA37-80-C-0493; DA Proj. 1T1-61102-BH-57)
(AD-A136109) Avail: NTIS HC A06/MF A01 CSCL 20/12

The application of modern surface science experimental techniques to probe free semiconductor surfaces and their interfaces with gases and meals has enabled a much greater understanding of the role that imperfections, defects, etc., play in the formation of Schottky barriers and related devices. In section 1 of this report we detail the interactions between various metals and vacuum cleaved and air cleaved (110) surfaces of CdTe. For metal vacuum cleaved CdTe interfaces we show that the interfaces formed are very non abrupt with interface widths in some cases exceeding twenty five angstroms. Also, provided one eliminates the systems where cadmium outdiffusion into high work function metals occurs then good agreement between the linear interface model in the Schottky limit and the data occurs. Where cadmium outdiffusion into high work function metals does occur it is postulated that Fermi level pinning in the band gap occurs due to the formation of doubly charged cadmium vacancies. The presence of an interfacial layer, due to oxidation or due to deposition of very thin (< 2 Angstroms) aluminum layers, between the vacuum cleaved CdTe surface and the metal overlayer drastically effects the Schottky barrier height. Oxidation of the surface prior to metal deposition always leads to an increase in Schottky barrier height. GRA

N84-19121# University of Southern California, Los Angeles. Dept. of Materials Science.
SCIENTIFIC REPORT ON THE INTERNATIONAL CONFERENCE ON METASTABLE AND MODULATED SEMICONDUCTOR STRUCTURES (MMSS) HELD AT PASADENA, CALIFORNIA ON 6-10 DECEMBER 1982 Final Report
A. Madhukar 26 Oct. 1983 28 p
(Grant AF-AFOSR-0211-82; AF Proj. 2306)
(AD-A136204; AFOSR-83-1075TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

A brief summary of the highlights of the International Conference on Metastable and Modulated Semiconductor Structures is provided. The report emphasizes the theme of conference, the

systematic coverage of related topics, and a technical discussion of the papers presented, their inter-relationship and future prospects. Author (GRA)

N84-19122# Argonne National Lab., Ill. Materials Science and Technology Div.
MELTING OF ELECTRONS ON CORRUGATED SURFACES: STRUCTURAL AND DYNAMICAL PROPERTIES IN LIQUID AND SOLID PHASES
P. Vashishta, R. K. Kalia, and J. J. Quinn (Brown Univ.) Nov. 1983 10 p refs Presented at the 3rd Intern. Conf. on Recent Prog. in Many-body Theories, Altenberg (West Germany), 29 Aug. - 3 Sep. 1983
(Contract W-31-109-eng-38)
(DE84-004023; CONF-8308125-4) Avail: NTIS HC A02/MF A01

Properties of a classical system of electrons on smooth and periodically corrugated surfaces are investigated using the molecular dynamics method. In the liquid phase, the electron-electron interaction, the total internal energy, the diffusivities parallel and perpendicular to the corrugation are all periodic functions of the wavevector of the corrugation. Thermodynamic and dynamical properties reveal a first order melting transition on the commensurate corrugated surface of wavevector lambda = square root of 3/2 a (system S2) shows a tricritical point separating a line of first order transitions from a line of continuous transitions. On the commensurate corrugation of wavelength lambda prime = square root of 3/4 a (system S4) melting transition is always first order. Topological analysis of particle coordinations shows bound dislocation pairs in the electron solid, a large number of defects and grain boundary loops to be responsible for a first order transition, and a small density of free dislocations to be the cause of continuous melting transition. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-19123# Manlabs, Inc., Cambridge, Mass.
COMPUTER-BASED METHODS FOR THERMODYNAMIC ANALYSIS OF MATERIALS PROCESSING Final Report, 1 Oct. 1979 - 30 Sep. 1983
Larry Kaufman 30 Nov. 1983 158 p
(Contract F49620-80-C-0020; AF Proj. 2306)
(AD-A136085; AFOSR-83-1099TR) Avail: NTIS HC A08/MF A01 CSCL 09/2

The data base previously developed for multicomponent Sialon Ceramic phase diagrams has been expanded to cover Ce2O3, BeO and Y2O3 additions. Isothermal sections in the MgO-Si3N4-SiO2, Y2O3-SiO2-SiN4 and Ce2O3-SiO2-Si3N4 system near 2000 K were computed and compared with limited experimental data. The trajectory of ordering temperatures for A2/B2 and B2/D03 reactions has been computed along the Fe3Si-Fe3Al composition path in the BCC of the Fe-A1-Si system and compared with experiment. The two phase (fcc & bcc) fields for ordered phases in the iron-aluminum-nickel, iron-aluminum-manganese, and the iron-nickel-manganese system between 700 C and 1200 C. Construction of a data base for fluoride systems consisting of systems containing ZrF4 which are employed to synthesize fluoride glasses has been initiated and used to calculate the composition of maximum liquid stability in the ZrF4-LaF3-BaF2 and the ZrF4-BaF2-NaF systems where glass formation has been observed. The calculations have been extended to consider the effects of AlF3 additions on the glass compositions with good results. An analysis of the titanium-carbon-nitrogen system coupling the thermochemical and phase diagram data was performed to calculate the ternary phase diagram and thermochemical properties over a range of temperature. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-19124# Defense Systems Management School, Fort Belvoir, Va.
MANAGEMENT OF RISK AND UNCERTAINTY IN SYSTEMS ACQUISITION: PROCEEDINGS OF THE 1983 DEFENSE RISK AND UNCERTAINTY WORKSHOP
R. F. Williams and R. D. Abeyta 15 Jul. 1983 292 p Workshop held in Fort Belvoir, Va., 13-15 Jul. 1983
(AD-A136230) Avail: NTIS HC A13/MF A01 CSCL 15/5

The general objectives of this workshop were to report on state of the art techniques and exchange information on risk and uncertainty within the Department of Defense Panel Sessions covered these topics: methods and models; budgeting and contracting risk; computer aids in decision making; management view of acquisition risk; behavior under risk and uncertainty; risk analysis; advanced theory; and issues in risk and uncertainty. GRA

N84-19125# Cornell Univ., Ithaca, N.Y.
[LASER AND PLASMA RESEARCH] Final Report
Richard L. Liboff 3 Jul. 1983 13 p
(Grant AF-AFOSR-3574-78; AF Proj. 2301)
(AD-A136519; R-5-83; AFOSR-83-1257TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

This document presents abstracts of technical report titled: first order estimate of the Saha equation for a helium plasma; exact solutions for interacting finite potential wells; dual propagation and absorption in a warm plasma half space; electrostatics in the plane; electron density profile in a recombining plasma; review of fundamental processes for matter radiation interaction 2; properties of a one dimensional Coulomb gas; kinetic theory for a short wavelength lasing plasma; excition laser amplifier; induced decay of positronium and grasers; study of a nuclear gamma ray laser; unified theory of plasma correlations. GRA

N84-19126# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
MULTIYEAR SUBCONTRACTOR SELECTION CRITERIA ANALYSIS M.S. Thesis
D. L. Gray and L. W. Sanders Sep. 1983 206 p
(AD-A135638; AFIT-LSSR-106-83) Avail: NTIS HC A10/MF A01 CSCL 05/1

Multiyear procurement (MYP) has been sited as an acquisition strategy used to check undesirable defense industry trends such as declining productivity, increasing weapon system costs, and declining subcontractor industrial base. The Department of Defense (DOD) has developed criteria for selecting prime contractors for MYP contracts, but no formal selection criteria have been established for selecting MYP-subcontractors. The research objectives were to: (1) determine the extent that MYP contracts are used for DOD programs; (2) determine the contract and subcontractor characteristics associated with the use of MYP subcontracts; and (3) determine the selection criteria that contractors consider important when contemplating the placement of MYP subcontracts with subcontractors. Comparative analyses were performed on the rankings of 23 MYP selection criteria. The research findings were: (1) MYP is not extensively used for DOD programs; (2) a common set of MYP contract and subcontractor characteristics were identified; and (3) an overall ranking of

23 MYP selection criteria for consideration in placing future MYP subcontracts was developed. GRA

N84-19127# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
Q-GERT MODEL OF THE CONTRACTING CYCLE M.S. Thesis
C. D. Miller Sep. 1983 700 p
(AD-A135639; AFIT-LSSR-118-83) Avail: NTIS HC A99/MF A01 CSCL 05/1

To improve the efficiency of a Government contracting organization, a manager must predict the consequences of decision alternatives. There are so many variables (workload, resources, experience levels, changing procedures) that predicting, or even measuring, the effect of various decision alternatives is very difficult. The research objective was to construct and test a Q-GERT model of the contracting cycle of an Air Force research and development contracting organization. Data were collected on the contracting procedures used. Twenty eight contract networks were developed, from the administrative notice to the 10 million dollar competitive contract. Each network was divided into many small tasks. Experienced buying personnel provided estimates of a range of time to complete each task. The result was that the model successfully imitated the contracting cycle time from receipt of the purchase request to the contract award. A manager can use the model to test the effect of changes in resources or procedures on the contracting cycle time. The model should be a valuable management tool. Author (GRA)

N84-19128# Mitre Corp., Bedford, Mass.
ARDS (AUTOMATED REQUIREMENTS DEVELOPMENT SYSTEM) USER'S MANUAL. VOLUME 1: DOCUMENT ANALYSIS, REVISION Final Report
J. S. Glenn, M. Hazle, B. M. Robinson, and Donna Jenkins, ed. Nov. 1983 129 p
(Contract F19628-82-C-0001; AF Proj. 5720)
(AD-A135925; MTR-8338-Vol-1-Rev-1; ESD-TR-83-191-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 05/2

The Automated Requirements Development System (ARDS) is a set of software tools that supports the requirements development activities for ESD system acquisition programs. ARDS was developed at MITRE under ESD/MITRE Project 5720, Embedded Computer Systems Engineering and Applications. ARDS runs on the MITRE-Bedford UNIX facility and supports documents generated with the WORD-11 and DEC stand-alone word-processing systems. This user's manual is an instructional guide for the use of the Document Analysis capability. Author (GRA)

N84-19129# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
SYSTEM ENGINEERING MANAGEMENT GUIDE
3 Oct. 1983 236 p
(Contract MDA903-82-C-0339)
(AD-A136020) Avail: NTIS HC A11/MF A01 CSCL 05/1

The primary objective of this Guide is to provide a working familiarity with System Engineering Management. System Engineering has gained increasing attention since its recognition following World War II. This has been stimulated by the increasing cost and technical complexity of development and acquisition programs. Some of this attention is no doubt due to large program failures which possibly could have been avoided, or at least mitigated, through the use of System Engineering. In today's acquisition environment it is not sufficient to apply only basic engineering principles. The complexity of a modern major weapon system requires conscious application of System Engineering principles and concepts to ensure producible, operable, and supportable systems that satisfy mission requirements. The Guide covers the development of a system from inception to operational deployment and use. It is divided into five modules: System Engineering Management; System Definition; Configuration Definition and Management; Technical Performance Achievement; and Operational Feasibility. GRA

N84-19130# Office of the Chief of Staff (Army), Washington, D.C.
THE ARMY STUDY PROGRAM FISCAL YEAR 1984 REPORT, VOLUME 1
1984 51 p
(AD-A136213) Avail: NTIS HC A04/MF A01 CSCL 05/1

The FY 84 Army Study Program presented herein includes command and agency study agendas for Fiscal Year 84. Volume I of The Army Study Program (TASP) contains a description of this year's study program in terms of Total Army Goals. A macro-analytical approach has once again been taken in an attempt to portray the direction taken by the Army study community in responding to the needs of the Army in terms of TOTAL ARMY GOALS and Performance Management Army. In addition to the analysis of the current program initiated with last year's TASP, a comparison of the FY 84 program is presented, illustrating the manner in which all of the goals are presented, and provides information on the program in terms of key parameters such as combat application, payback, study status and performance method. GRA

N84-19131# Office of the Chief of Staff (Army), Washington, D.C.
THE ARMY STUDY PROGRAM FISCAL YEAR 1984 REPORT, VOLUME 2
1984 196 p
(AD-A136214) Avail: NTIS HC A09/MF A01 CSCL 05/1

The FY 84 Army Study Program presented herein includes command and agency study agendas for Fiscal Year 84. This year's edition of The Army Study Program (TASP) expands and improves upon the format adopted last year, and is intended to complement the two volume edition published by this office entitled Management Support Services which details efforts conducted under the aegis of AR 5-14, Managing Analytical Support Services. Within Volume II, much of the data contained in former editions of the TASP is presented, albeit in new and hopefully more usable formats. Listings of individual studies, statistical data pertaining to those studies, and study points of contact are included. More detailed information about each study is also presented, to include study description, resource level, combat application, expected end use, and relationship to each of the TOTAL ARMY GOALS. GRA

N84-19132# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.
A SET OF ORGANIZATIONAL-CLIMATE MEASURES: INTERNAL CONSISTENCY, FACTOR STRUCTURE, AND PREDICTIVE POWER Final Report, Jan. 1980 - Dec. 1981
Grant E. Secrist, Richard C. McNee, and Vabian L. Paden Oct. 1983 30 p
(AF Proj. 7930)
(AD-A135352; SAM-TR-83-26) Avail: NTIS HC A03/MF A01 CSCL 05/1

A major obstacle to understanding organizational behavior is the lack of highly reliable instruments to assess the principal dimensions of an organization's climate. The analysis reported here was undertaken to improve the precision of a set of organizational-climate measures grounded on a new theoretical-conceptual model of human and organizational effectiveness, and to provide a related taxonomy of climate dimensions. The data base for the analysis consisted of approximately 1,000 U.S. Air Force scientist-engineers working in five separate Government research and development organizations. Internal consistency analysis and factor analysis were used to assess reliability and dimensional purity, while correlational analysis was used to evaluate relations with selected performance and job-satisfaction criteria. The organizational-climate measures demonstrated promising psychometric characteristics. Generally high reliabilities (.80 to .95), satisfactory factor structure, and encouraging validities provide a sound foundation for further refinement. GRA

N84-19168# Semiconductor Research Corp., Research Triangle Park, N.C.
VLSI SIGNAL PROCESSING: BASIS FOR COOPERATION Final

Report
L. W. Sumney *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 211-213 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 05/1

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-19133* National Aeronautics and Space Administration, Washington, D. C.
SIGNIFICANT NASA INVENTIONS AVAILABLE FOR LICENSING IN FOREIGN COUNTRIES
1978 114 p
(NASA-SP-7038(05); NAS 1.21:7038(05)) Avail: HC SOD CSCL 05B

Aeronautics; space flight and satellites; chemistry, and polymers and materials; electrical, electronics, and computers; fluid mechanics and heat transfer; instrumentation; solar energy; medical and life sciences; photography and optics; mechanical engineering, testing, and metal forming; and lasers and masers are covered. N.W.

N84-19134* National Aeronautics and Space Administration, Washington, D. C.
SIGNIFICANT NASA INVENTIONS AVAILABLE FOR LICENSING IN FOREIGN COUNTRIES
1984 156 p
(NASA-1984-SP-7038(07); NAS 1.21:7038(07)) Avail: HC SOD $4.75 as 033-000-008-96-1 CSCL 05B

Aeronautics; space flight and satellites; chemistry, polymers, and materials; electrical, electronics and computers; fluid mechanics and heat transfer; instrumentation; solar energy; medical and life sciences; photography and optics; mechanical engineering, testing, and metal forming; and lasers and masers are covered. N.W.

N84-19135# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
METEOROLOGICAL DATABASE [BANCO DE DADOS METEOROLOGICOS]
Pauo Seiji Nakaya, Luiz Fernando Capretz, Fernando Antonio Araujo Motta, and Jose Aparecido Torsani Jun. 1983 24 p refs In PORTUGUESE; ENGLISH summary Presented at the 16th Natl. Informatics Conf., Sao Paulo, Oct. 1983
(INPE-2790-PRE/353) Avail: NTIS HC A02/MF A01

The Meteorological Database System currently in operation at INPE which permits the updating, consultation and recovery of diverse types of meteorological data is presented. Taking into account the total volume and the growth rate of the existing archive, and minimizing the utilization of computer resources, the statistical Database technique, this database contains a summary and a mapping of the general archive. A user-friendly language was developed which makes possible on-line consultation at the statistical data base. During consultation one may also ask the recovery of actual data, this being realized afterwards in batch mode. Author

N84-19136*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE BIBLIOGRAPHY, SEVENTH EDITION
Jean F. Blashfield, comp. 1983 140 p
(NASA-TM-85438; NAS 1.15:85438) Avail: NTIS MF A01; HC SOD CSCL 05B

Space travel, planetary probes, applications satellites, manned spaceflight, the impacts of space exploration, future space activities, astronomy, exobiology, aeronautics, energy, space and the humanities, and aerospace education are covered. N.W.

N84-19137*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SCIENTIFIC AND TECHNICAL INFORMATION OUTPUT OF THE LANGLEY RESEARCH CENTER
Jan. 1984 236 p refs
(NASA-TM-85735; NAS 1.15:85735) Avail: NTIS HC A11/MF A01 CSCL 05B

Scientific and technical information that the Langley Research Center produced during the calendar year 1983 is compiled. Included are citations for Formal Reports, Quick-Release Technical Memorandums, Contractor Reports, Journal Articles and other Publications, Meeting Presentations, Technical Talks, Computer Programs, Tech Briefs, and Patents. Author

N84-19138# University of Southern California, Los Angeles.
PROCEEDINGS OF USC WORKSHOP ON VLSI AND MODERN SIGNAL PROCESSING Final Report, 1 Oct. 1982 - 30 Sep. 1983
Sun-Yuan Kung, ed. 15 Nov. 1983 227 p refs Workshop held in Los Angeles, 1-3 Nov. 1982
(Grant N00014-83-G-0031; NR Proj. 049-459)
(AD-A136855; EES101) Avail: NTIS HC A11/MF A01 CSCL 05/2

The broad range of the presentations in the workshop can roughly be divided into three main categories: (A) Signal processing methods and architectures: This category is subdivided into: (1) modern signal processing, (2) signal processing architectures and the speech processing architectures, (3) image processing, recognition and analysis, and (4) implementation of signal processors. (B) Parallel processors: algorithms, languages, and architectures: This category is subdivided into: (1) systolic processors, (2) Fault tolerant computing structures, (3) reconfiguration and partitioning (4) numerical algorithms and arithmetics and (5) language and formal descriptions, and (C) VLSI and Signal processing: As the central theme of the workshop, this issue has been, at least partially, addressed by all the papers. However, there are several of them more directly confronting the issue. For individual titles, see N84-19139 through N84-19168.

N84-19139# Naval Ocean Systems Center, San Diego, Calif.
SIGNAL PROCESSING APPLICATIONS OF SYSTOLIC ARRAY TECHNOLOGY (EXTENDED SUMMARY) **c64**
H. J. Whitehouse, J. M. Speiser, and K. Bromley *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 5-10 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

Architectures and algorithms are examined for exploiting the large number of degrees of freedom available in current very large scale integration and projected very high speed integrated circuit technologies to provide real-time implementations for sonar signal processing tasks. The matrix computation requirements for signal processing tasks including adaptive filtering, ambiguity function computation, recent methods of spectrum analysis and direction finding are discussed. Parallel processing architectures for implementating these computations are compared, with emphasis on recent developments in systolic architectures providing modular parallelism, local interconnects, and regular data flow for the major signal processing computations. R.J.F.

N84-19140# California Univ., Berkeley. Electronics Research Lab.
A THOUSAND-WORD SPEECH-RECOGNITION SYSTEM USING SPECIAL-PURPOSE MOS-LSI **c32**
Hy Murveit, Meni Lowy, and Bob Brodersen *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 13-18 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 17/2

A metal oxide semiconductor-large scale integration speech

recognition system that is capable of accurately recognizing a large vocabulary of isolated words in real time is discussed. This system uses two custom-designed integrated circuits, memory, and a control microprocessor. A prototype of the system was built and its performance was analyzed. It was found that it recognizes speech very accurately. R.J.F.

N84-19141*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PARALLEL VLSI ARCHITECTURE FOR A DIGITAL FILTER USING A NUMBER THEORETIC TRANSFORM c64
T. K. Truong, I. S. Reed (University of Southern California), C.-S. Yeh (University of Southern California), and H. M. Shao (University of Southern California) *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 19-24 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

The advantages of a very large scalee integration (VLSI) architecture for implementing a digital filter using fermat number transforms (FNT) are the following: It requires no multiplication. Only additions and bit rotations are needed. It alleviates the usual dynamic range limitation for long sequence FNT's. It utilizes the FNT and inverse FNT circuits 100% of the time. The lengths of the input data and filter sequences can be arbitraty and different. It is regular, simple, and expandable, and as a consequence suitable for VLSI implementation. R.J.F.

N84-19142# TRW Defense and Space Systems Group, Redondo Beach, Calif.
FREQUENCY DOMAIN DIGITAL FILTERING WITH VLSI c33
Earl E. Swartzlander, Jr. and George H. Hallnor *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 25-30 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

During the last decade, a new generation of integrated circuits was developed that is directly applicable to the implementation of advanced digital signal processors. Examples of such circuits include microprocessors, fast wide word memories, single chip multipliers, floating point adders, etc. Although of independent interest, such circuits are significant primarily as components for the development of more complex systems. It is shown how one such system, a very high performance digital filter, is implemented using current technology. R.J.F.

N84-19143# California Inst. of Tech., Pasadena.
CONCURRENT ALGORITHMS AS SPACE-TIME RECURSION EQUATIONS c64
Marina C. Chen and Carver A. Mead (California Inst. of Technology) *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 31-52 refs (For primary document see N84-19138 09-82)
(Contract N00014-79-C-0597; ARPA Order 3771)
Avail: NTIS HC A11/MF A01 CSCL 12/1

In this paper, we describe a methodology and a single notation for the specification and vaerification of synchronous and self-timed concurrent systems ranging from the level of transistors to communicataing processes. The uniform treatment of these systems results in a powerful abstraction mechanism which allows management of system complexity. Author (GRA)

N84-19144# California Inst. of Tech., Pasadena. Dept. of Computer Science.
A FORMAL DERIVATION OF ARRAY IMPLEMENTATIONS OF FFT ALGORITHMS c64
Lennart Johnsson and Danny Cohen (University of Southern California, Marina del Rey) *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 53-63 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

Fast Fourier Transform algorithms are interesting for direct hardware implementation in VLSI. The description of FFT algorithms is typically made either in terms of graphs illustrating the dependency between different data elements or in terms of mathematical expressions without any notion of how the computations are implemented in space or time. Expressions in the notation used in this paper can be given an interpretation in the implementation domain. The notation is in this paper used to derive a description of array implementations of decimation-in-frequency and decimation-in-time FFT algorithms. Correctness of the implementations is guaranteed by way of derivation. Author (GRA)

N84-19145*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROBLEM-ORIENTED SPECIFICATION OF CONCURRENT ALGORITHMS c61
Armin B. Cremers (Dortmund Univ.) and Thomas N. Hibbard *In* University of Southern California Proc. of USC Workshop on VLSi and Mod. Signal Process. 15 Nov. 1983 p 64-68 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

The main purpose of the present paper is to suggest an executable algorithmic notation for VLSI solutions which, in many cases, may be more natural than traditional programming notation. Author (GRA)

N84-19146# Fairchild Lab. for Artificial Intelligence Research, Palo Alto, Calif.
AN OVERVIEW OF SIGNAL REPRESENTATIONS IN SIGNAL PROCESSING LANGUAGES c61
Gary E. Kopec *In* University of Southern California Proc. of USC Workshop on VLSi and Mod. Signal Process. 15 Nov. 1983 p 69-73 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

This paper reviews three approaches to the representation of discrete-time signals as objects in programs. The first two representations, arrays and streams, are widely used in contemporary signal processing programming. The third representation was introduced in the recently-proposed signal representation language SRL(5). SRL signals are abstract objects whose properties are explicitly designed to reflect those of the represented signals-arrays, streams and SRL signal objects whose properties are explicitly designed to reflect those of the represented signals. Arrays, streams and SRL signal objects are discussed in the context of a set of signal representation criteria which are motivated by elementary observations about the mathemtics of discrete-time signals. The emphasis in this paper is on the semantics of signal representation rather than on issues to time or space-efficiency. Author (GRA)

N84-19147# Wisconsin Univ., Madison. Dept. of Computer Sciences.
MULTI-COMPUTER PARALLEL ARRAYS, PIPELINE ARRAYS AND PYRAMIDS c60
Leonard Uhr *In* University of Southern California PRoc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 74-75 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

This paper describes and examines parallel arrays, pipeline arrays and pyramids of arrays - their architecture, the kinds of image processing and pattern perception algorithms and programs for which they appear to be appropriate, and their appropriateness for VLSI implementations. Author (GRA)

N84-19148# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
PARALLEL IMPLEMENTATION OF LIKELIHOOD-BASED ESTIMATION AND DETECTION c64
Donald W. Tufts and Louis L. Scharf *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 76-82 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

Old and new information is presented about the implementation of the detection of signals, the estimation of signals, and the estimation of parameters of signals. In all cases the processing

consists of exact or approximate calculation of the logarithm of a likelihood function. The form of the likelihood is based on Gaussian statistics, even when the signal and interference are not Gaussian random functions. Author (GRA)

N84-19149# Colorado Univ., Boulder. Dept. of Electrical Engineering.
DIGITAL SIGNAL PROCESSING STRUCTURES FOR VLSI c33
Richard A. Roberts and Clifford T. Hullis *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 83-88 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

Digital signal processing (DSP) encompasses a variety of tasks which include linear (digital) filtering, spectral estimation, signal generation, correlation, time varying or adaptive filtering and other similar tasks. This work is directed at obtaining special purpose structures for DSP tasks that are well suited for VLSI implementation. Author (GRA)

N84-19150# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
LINEAR OR SQUARE ARRAY FOR EIGENVALUE AND SINGULAR VALUE DECOMPOSITIONS? c33
Sun-Yuan Kung and R. J. Gal-Ezer *In its* Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 89-98 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/5

For many signal and image processing applications, such as high resolution spectral estimation, image data compression etc., eigenvalue and singular value decompositions have emerged as extremely powerful and efficient computational tools. As far as the symmetric eigenvalue problem is concerned, QL and QR algorithms ... have emerged as the most effective way of finding all the eigenvalues of a small symmetric matrix. A full matrix is first reduced to tridiagonal form by a sequence of reflections and then the QL (OR) algorithm swiftly reduces the off diagonal elements until they are negligible. The algorithm repeatedly applies a complicated similarity transformation to the result of the previous transformation, thereby producing a sequence of matrices that converges to a diagonal form. What is more, the tridiagonal form is preserved. Therefore, the QR algorithm can be regarded as the best sequential algorithm available to date. The question is whether or not the QR algorithm may retain that same effectiveness when mapped into a parallel algorithm on a square or linear multiprocessor array. In this note, the authors offer an answer to this question using the computational wavefront notion.
Author (GRA)

N84-19151# Mayo Foundation, Rochester, Minn.
SIGNAL PROCESSING IN HIGH DATA RATE ENVIRONMENTS. DESIGN TRADEOFFS IN THE EXPLOITATION OF PARALLEL ARCHITECTURES AND FAST SYSTEM CLOCK RATES. AN OVERVIEW c33
B. K. Gilbert, T. M. Kinter, D. J. Schwab, B. A. Naused, L. M. Krueger, K. M. Rice, and F. S. Lee (Rockwell International Microelectronics) *In* University of Southern California Proc. of USC Workshop on VLS and Mod. Signal Process. 15 Nov. 1983 p 100-105 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

This conference is exploring the methods by which the emerging very large scale integration (VLSI) technology, i.e., the ability to place more than 10,000 logic gates on a single integrated circuit, can be exploited for the solution of difficult signal processing problems. The following discussion will concentrate on a highly specialized subset of the total signal processing environment, i.e., that small minority of such problems in which a single unprocessed data stream appears at the input of a digital processor in real time and at very high data bandwidths. These high volume data streams must be processed by the front end of the signal processor at clock rates equal to or greater than the rates at which they are delivered; in later stages of processing, it may be possible to partition the single high-speed data stream into a series of lower speed substreams and to institute parallel processing on the substreams. We have been compelled to consider potential solutions to these high data rate problems, and to compare these problems with the capabilities of silicon VLSI, as well as other technologies, with which they may be addressed. Author (GRA)

N84-19152# Thomson-CSF, Cagnes sur Mer (France). Div. des Activites Sous-Marines.
NEW PRINCIPLE OF ARRAY PROCESSING IN UNDERWATER PASSIVE LISTENING c33
G. Bienvenu and H. F. Mermoz *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 110-113 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/5

One of the main function of an underwater passive listening system is the reckoning of the number of present sources as well as the characteristic parameters of everyone. To do so, the noises transmitted by the sources are used when recorded on the sensors of an array. The basic tool is the spatial processing. The traditional tool is the classical beamforming. Then, in view of improving the performance, one came to adaptive beamforming of a sensor array. As a result, this method brings an improvement - an array gain - which is asymptotically bound by the signal to noise ratio of the source noises, when measured on a particular sensor. More recently have appeared more powerful methods called high resolution. The improvement in performance as compared to previous processing is at the cost of one more assumption on the medium. Nevertheless, these methods carry the possibility to include free parameters in the medium model, and that make more flexible the assumptions to be accepted. Author (GRA)

N84-19153# Naval Underwater Systems Center, New London, Conn.
HIGH RESOLUTION SPECTRUM ANALYSIS BY DOMINANT MODE ENHANCEMENT c64
Norman L. Owsley *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 114-118 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

High-resolution, data adaptive spectrum analysis techniques can exploit prior knowledge of the signal dimensionality and noise coherence to obtain even higher resolution capabilities than previously envisioned. The classical minimum variance (maximum likelihood) and maximum entropy (ME) spectrum estimators form the basis for corresponding enhanced estimators which require only a prior knowledge of signal bandwidth to provide resolution which is limited only by observation time. The basic idea is to identify only that portion of the estimated data covariance matrix which corresponds to the coherent signal portion of the analysis data. This can be accomplished alternatively by eigensystem analysis, singular value decomposition and Cholesky factorization of the estimated signal only covariance matrix. In this paper, the dominant mode form of the analysis data covariance matrix is presented along with expression for the readily derived inverse of this matrix. Next, the minimum variance (MV) and ME spectrum estimators in model decomposition form are developed along with 3 dB down resolution expressions. Finally, the modal MV and ME estimators are applied to passive sensor array processing for source range estimation. Author (GRA)

N84-19154# California Univ., Berkeley. Dept. of Mathematics.
STATE OF THE ART IN EIGENVALUE COMPUTATIONS c64
B. N. Parlett *In* University of Southern California Proc. of USC Workshop on VLSI and MOd. Signal Process. 15 Nov. 1983 p 119-122 (For primary document see N84-19138 09-82)
(Contract N00014-76-C-0013)
Avail: NTIS HC A11/MF A01 CSCL 12/1

The subject must be divided up according to two obvious but unappreciated criteria. Matrices are either large or small and the eigenvalues are either real or complex. Moreover, the property that produces real eigenvalues in the overwhelming number of cases is the symmetry of a real matrix. Definition: An n x n matrix

is small (in a given computer system) if it and its matrix of eigenvectors can be held as conventional square arrays in the fast (random access) store or memory. Otherwise it is large.
Author (GRA)

N84-19155# University of Southern California, Los Angeles. Dept. of Electrical Engineering - Systems.
IMPACT OF VLSI ON MODERN SIGNAL PROCESSING **c33**
Sun-Yuan Kung *In its* Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 123-132 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/1

Driven by steep increase in the complexity of computations, processing speed requirements and the volume of data handled in various signal processing applications, modern signal processing research and development is undergoing a major revolution. On the other hand, the availability of low cost, high density, fast-speed VLSI devices has timely opened a new avenue for implementing these increasingly sophisticated algorithms and systems. Therefore, the future trend of VLSI signal processing research will require very close interactions between different disciplines in VLSI, computer engineering, and signal processing. This paper addresses three fundamental issues: (1) impact of VLSI on signal processing methods, (2) impact of VLSI on VLSI on array processors for signal processing, (3) integrated design of signal processing systems. The purpose is to provide a cross-disciplinary understanding of the modern signal processing techniques, parallel array processors, and VLSI technology potentials and constraints.
Author (GRA)

N84-19156# Integrated Systems, Inc., Palo Alto, Calif.
A SYSTOLIC SIGNAL PROCESSOR FOR RECURSIVE FILTERING **c33**
Richard H. Travassos *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 134-138 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/3

This paper describes the design of a systolic signal processor for recursive Kalman filtering. The architecture of the processor is based on mapping the Kalman filter equations onto a linearity connected systolic array. A successful prototype of the systolic Kalman filter processor has been constructed using state-of-the-art VLSI components. The systolic processor is well-suited for recursive filtering, beam forming, target tracking, image processing and radar signal processing.
Author (GRA)

N84-19157# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
AN APPROACH TO RELIABLE PARALLEL DATA PROCESSING **c60**
Gerard G. L. Meyer and Howard L. Weinert *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 139-144 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

Modern acquisition techniques produce high volume data sets that must be processed not only very quickly, but also reliably. The computational speed requirements can be achieved only through the use of either faster processing algorithms, or computational components with improved performance, or parallelism. The likelihood of further major advanced in regard to the first two options is small. Therefore, the only realistic means for achieving high throughput is the use of parallelism.
Author (GRA)

N84-19158# Northwestern Univ., Evanston, Ill. Dept. of EECS.
YIELD ENHANCEMENT BY FAULT TOLERANT SYSTOLIC ARRAYS (SUMMARY) **c64**
Robert H. Kuhn *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 145-152 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

Interstitial fault tolerance (IFT), a technique for incorporating fault tolerance into systolic arrays in a natural manner, is discussed. The IFT can be used for reliable computation or for yield enhancement. The IFT used for yield enhancement is compared to wafer scale integration (WSI) techniques. Previous WIS techniques for yield enhancement were proposed only for linear processing element arrays. It is found that IFT is effective for both linear and two dimensional arrays.
E.A.K.

N84-19159# University of Southern California, Marina del Rey.
THE IMPACT OF VLSI ON SIGNAL PROCESSING **c33**
Danny Cohen and Lennart Johnsson (California Inst. of Technology) *In its* Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 153-156 (For primary document see N84-19138 09-82)
(Contract MDA903-81-C-0335)
Avail: NTIS HC A11/MF A01 CSCL 09/3

Signal processing and real time simulation which require large amounts of computation are discussed. General purpose computers are too costly for real time applications, and special purpose hardware is not flexible enough for research and development work. Traditionally, peripheral array processor (PAP) provide a cost effective compromise that combines large amounts of computation performed at a very high rate, at a reasonable cost, and without loss of generality or programmability. The PAPS are used as the baseline for the discussion of signal processing engines. New alternatives have emerged, such as the signal processor on a chip and numerous special purpose processing devices.
E.A.K.

N84-19160# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
VLSI ARCHITECTURES FOR RECOGNITION OF CONTEXT-FREE LANGUAGES **c60**
K. S. Fu, Y. T. Chiang, and K. M. Chu *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 159-161 (For primary document see N84-19138 09-82)
(Grant NSF ECS-80-16580)
Avail: NTIS HC A11/MF A01 CSCL 09/2

The speed of formal languages recognition is frequently considered to be important in many applications such as syntactic pattern recognition, artificial intelligence, natural language processing, syntax analysis of programming languages, pattern matching, etc. With the continuing advances in very large scale integration (VLSI) technology making circuitry smaller and faster, many processors can now be put together on a single chip and communicate with each other at chip speeds. This offers the opportunity in building low cost, high performance, special purpose multiprocessor architectures to aid in the rapid solution of sophisticated language recognition problems. Two VLSI architectures are introduced for high speed recognition of general context free languages. These languages are most commonly used in the mentioned areas and their recognition methods have been well studied. The recognition methods are based on he Cocke-Younger-Kasami algorithm and Earley's algorithm. Multiprocessing and pipelining techniques are used in the architectures to execute the algorithm in parallel.
Author (GRA)

N84-19161# Maryland Univ., College Park. Computer Vision Lab.
PARALLEL ALGORITHMS FOR IMAGE ANALYSIS, EXTENDED SUMMARY **c61**
Azriel Rosenfeld *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 162-167 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

Image processing and analysis (IPA) systems employ a wide variety of techniques for image encoding, transformation, segmentation, and property measurement. Many of these techniques are suitable for efficient parallel implementation. Some general classes of IPA algorithms are defined and implementation of such algorithms in parallel using various types of cellular multiprocessor architectures is indicated.
GRA

N84-19162# Hughes Research Labs., Malibu, Calif.
CONCURRENT VLSI ARCHITECTURES FOR TWO DIMENSIONAL SIGNAL PROCESSING SYSTEMS c60
J. G. Nash and G. R. Nudd *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 167-173 refs (For primary document see N84-19138 09-82)
(Contract N00014-81-K-0191; Grant NSF ECS-80-16581)
Avail: NTIS HC A11/MF A01 CSCL 09/2

Because of the availability of low power, high density VLSI and recent developments in parallel algorithms, there presently exists a significant opportunity for dramatic advances in intelligent signal and image processing systems. Typical applications range from CAD/CAM for automation and robotics to intelligent communications, radar and image analysis systems. The computational issues associated with detection and analysis of images, whether obtained by synthetic aperture radar, infrared radiometry, or visible imaging wre examined. Two types of developments are interpreted: (1) simple extensions of our present systems, such as enhanced resolution of radar and electro-optical imaging due to an increased processor throughputs and (2) the emergence of more intelligent and autonomous systems. E.A.K.

N84-19163# Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
VLSI ARCHITECTURES FOR PATTERN ANALYSIS AND IMAGE DATABASE MANAGEMENT c60
Kai Hwang *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 174-184 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

VLSI computing structures are introduced for the analysis and management of imagery data. It is argued that machine intelligence would be greatly enhanced if new generation of computers could be designed to process multidimensional imagery data above the string processing of alphanumerical information by present computers. Practical applications of computers include the processing of biomedical images for diagnosis, the recognition of characters, fingerprints, and moving objects, remote sensing, industrial inspection, robotic vision, military intelligence, and data compression for communications. Image analysis refers to the use of digital computers for Pattern Recognition and Image Processing (PRIP). On-line imagery data needs to be restored on disks and fastly retrieved for PRIP applications. A VLSI based image analysis machine should integrate both pattern analysis and image data base management capabilities into a unified system design. E.A.K.

N84-19164# Syracuse Univ., N. Y.
SOME CRITICAL ISSUES IN VLSI SIGNAL PROCESSOR IMPLEMENTATION c33
Noble R. Powell *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 185-196 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/3

The casting within the structure of the several design phases from concept to demonstration and test of critical issues pertaining to the very large scale integration of signal processor implementation is discussed. It is suggested, using a Matrix Functional Processor consisting of an array of LSI devices, that there are at least four critical issues supporting the contention that the signal processing community could benefit from revisions in educational programs, from improvement in design aids with extended data bases, and from revisions in the traditional design processes. Greater integration of the physical aspects extending and limiting signal processor performance into the conceptualization and comparative analysis of designs intended for implementation are recommended. GRA

N84-19165# Codex Corp., Mansfield, Mass.
A COMPARISON OF ARITHMETIC UNITS IN VLSI SIGNAL PROCESSING SYSTEMS c60
Hassan M. Ahmed *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 197-200 refs (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/2

Digital Signal Processing (DSP) is a term encompassing a variety of techniques for transforming digital samples of analog signals into samples of analog signals having more desirable characteristics. The DSP techniques which involve arithmetic in the usual sense, i.e., addition, multiplication are outlined. GRA

N84-19166# Microelectronics Center of North Carolina, Research Triangle Park.
THE MICROELECTRONICS CENTER: A NEW FORCE IN COOPERATIVE VLSI SIGNAL PROCESSING RESEARCH Final Report c33
Richard B. Fair *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 202-207 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 09/3

The needs of the microelectronics industry in applying VLSI to modern signal processing are stated: (1) to innovate new designs at a rapid rate: (2) to maintain an edge on the numbers of new designs and innovations; (3) to reduces the amount of parallel research and development efforts required to make effective technology and design decisions and to achieve successful market dominance. GRA

N84-19167# Office of Naval Research, Washington, D. C.
COMPUTING THEORY AND PRACTICE Final Report c64
Richard L. Lau *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 208-210 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 12/1

The evolution of the relationship between theory and practice in computational sciences is crucial to the healthy development of these sciences and the corresponding engineering practice. Many subdisciplines in computer science research or practice have formed the basis of theoretical work which is aimed at shedding light on the corresponding applied work. This theoretical work is distinguished by the use of mathematical tools or modes of thinking. The benefits and pitfalls of theory, with an emphasis on pitfalls are discussed. There will be a tendency here to apply somewhat pejorative terms to theoretical work with little impact on practice. The point of view is that of one who is seeking a payoff from research in the medium term. E.A.K.

N84-19168# Semiconductor Research Corp., Research Triangle Park, N.C.
VLSI SIGNAL PROCESSING: BASIS FOR COOPERATION Final Report c81
L. W. Sumney *In* University of Southern California Proc. of USC Workshop on VLSI and Mod. Signal Process. 15 Nov. 1983 p 211-213 (For primary document see N84-19138 09-82)
Avail: NTIS HC A11/MF A01 CSCL 05/1

Beam forming in phased array antennas and sonar, digital spectral analysis for electronic warfare, and target classification were cited as the major needs pushing the signal processing device technology to ever higher throughput rates. The need for these higher throughput rates is one of the major drivers for the VHSIC Program. The availability of other applications of signal processing, i.e., nondefense applications that can provide a basis for cooperation among the identified VLSI communities of interest are examined. The VLSI/signal processing relationship is examined. E.A.K.

N84-19169# Alpha Omega Group, Inc., Harvard, Mass.
FUNCTIONAL AND DATABASE ARCHITECTURE DESIGN
26 Sep. 1983 18 p
(Contract N00014-83-C-0525)
(AD-A136275) Avail: NTIS HC A02/MF A01 CSCL 05/2

Much attention and considerable effort has been focused recently on the collection and storage of descriptions of an organization's data and information resources. Some organizations have been quite successful in this collection and storage effort. A different problem, which is more difficult to deal with, has been to

provide an easy, effective mechanism for users to access this information once it is stored. This problem generally reduces to determining the existence of information. The Locator and Classifier for Universe Standardization (LOCUS) is a concept which seeks to provide a tool which will aid the user in determining the existence and location of the information about data' (i.e., metadata) which is required to perform some task. It is important to emphasize here that LOCUS is a system which operates on metadata, not data itself. GRA

N84-19170# University of Southern California, Los Angeles. Dept. of Computer Science.
DESIGN OF OFFICE INFORMATION SYSTEMS
Ellis Horowitz and Balaji Narasimhan 8 Nov. 1983 33 p
(Grant AF-AFOSR-0232-82; AF Proj. 2304)
(AD-A136523; AFOSR-83-1253TR) Avail: NTIS HC A03/MF A01 CSCL 05/1

We outline the essential components of a truly integrated OIS. Then we critically examine four of the existing prototype systems and another suggested design. These systems have the common characteristic of providing a form based user interface. Then we present a set of requirements for such an OIS. GRA

N84-19171# Ohio State Univ., Columbus. Dept. of Computer and Information Science.
DISTRIBUTED KNOWLEDGE BASE SYSTEMS FOR DIAGNOSIS AND INFORMATION RETRIEVAL Interim Report, 1 Jul. 1982 - 30 Jun. 1983
B. Chandrasekaran Nov. 1983 6 p
(Grant AF-AFOSR-0255-82; AF Proj. 2304)
(AD-A136577; AFOSR-83-1242TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

In the original proposal the investigators had outlined a long term program for conducting research in knowledge based systems. In particular they proposed to study issues in diagnostic reasoning and in knowledge-directed information retrieval. During the first year most of the progress came in the area of diagnostic reasoning and in the conceptual foundations of knowledge-based systems in general. The investigators also developed an approach to a new type of task: design of mechanical parts. This report summarizes specific progress made in these areas. Author (GRA)

N84-19172# Stanford Univ., Calif. Dept. of Computer Science.
RULE-BASED STATISTICAL CALCULATIONS ON A DATABASE ABSTRACT Ph.D. Thesis, Jun. 1983
Neil Charles Rowe Jun. 1983 163 p
(Contract N00039-82-C-0250)
(AD-A136638; SU-STAN-CS-83-975) Avail: NTIS HC A08/MF A01 CSCL 05/2

The size of data sets subjected to statistical analysis is increasing as computer technology develops. Quick estimates of statistics rather than exact values are becoming increasingly important to analysts. The authors proposes a new technique for estimating statistics on a database, a top-down alternative to the bottom-up method of sampling. This approach precomputes a set of general-purpose statistics on the database, a database abstract, and then uses a large set of inference rules to make bounded estimates of other, arbitrary statistics requested by users. The inference rules form a new example of an artificial-intelligence expert system. There are several important advantages of this approach over sampling methods, as is demonstrated in part by detailed experimental comparisons for two quite different data bases. Author (GRA)

N84-19173# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 37, NO. 12 Monthly Publication
L. E. Shaffer, ed. Dec. 1983 69 p
(AD-A135883; ESN-37-12) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists travelling in Europe may also be invited to author an ESN article. Author (GRA)

N84-19174# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE AUTOMATED INFORMATION RETRIEVAL SYSTEM IN THE FIELD OF SCIENCE AND SCIENCE POLICY--AWION
B. Krygier 9 Nov. 1983 26 p Transl. into ENGLISH from Zagadnienia Inform. Nauk. (Poland), no. 2(29), 1976 p 61-79
(AD-A135565; FTD-ID(RS)T-1527-83) Avail: NTIS HC A03/MF A01 CSCL 05/2

The scope (subject), task, and function of Poland's automated information system for science (AWION) are characterized. Topics covered include the information source for the system and set organization; the science and science policy thesaurus; the general basis of data processing; conditions for functioning of the AWION system; and the linking of AWION with domestic and foreign information systems in the field of social sciences. Author

N84-19175# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AUTOMATED STORAGE AND RETRIEVAL SYSTEMS--A CONSOLIDATION OF GUIDANCE FOR PROJECT MANAGEMENT AND IMPLEMENTATION M.S. Thesis
T. K. Betts and J. H. Mucci Sep. 1983 224 p
(AD-A135571; AFIT-LSSR-91-83) Avail: NTIS HC A10/MF A01 CSCL 05/2

Presently Air Force management of Automated Storage and Retrieval Systems (ASRS) projects lacks comprehensive guidance. No single document synthesizes all of the considerations for planning of automated materials handling equipment or automated warehouses. In addition, current guidance used for ASRS project planning and management are inadequate for such a complex undertaking. This thesis reviews up-to-date trends in the materials handling industry and modern ASRS project management. From the review, those considerations relevant to future Air Force ASRS projects are evaluated. Additionally, recommendations on how future Air Force ASRS projects should be planned and managed are offered. The recommendations put forward in this thesis should benefit managers of future Air Force ASRS projects. Author (GRA)

N84-19176# Stanford Univ., Calif. Dept. of Computer Science.
UNIVERSAL RELATION DATABASE SYSTEMS Annual Report, 1 Sep. 1982 - 31 Aug. 1983
Jeffrey D. Ullman Aug. 1983 7 p
(Grant AF-AFOSR-0212-80; AF Proj. 2304)
(AD-A135707; AFOSR-83-0962TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

The query facility for their universal relation database system is now working. The fundamental paper unifying ideas on what a UR system can and should be has been published. A paper surveying developments in the field of universal relation systems was invited for the triennial IFIP Congress and was delivered in September. Some initial results on logical theories applied to the problem of updating views have been obtained. There have been a number of developments concerning inference of inclusion dependencies and on the complexity of deciding certain properties of data base schemes. Some interesting results on the difficulty of obtaining hash functions that work well for particular sets of data have been obtained and won an award. Author (GRA)

N84-19177# University of Southern California, Marina del Rey. Information Sciences Inst.
ACTIVE DATABASES AS A PARADIGM FOR ENHANCED COMPUTING ENVIRONMENTS
Matthew Morgenstern Oct. 1983 21 p Presented at the 9th

Intern. Conf. on Very Large Data Bases, Florence, Oct. 1983
(Contract MDA903-81-C-0335)
(AD-A135808; AD-E401101; ISI/RS-83-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

Active databases emphasize the notion that a body of information is dynamic and should respond intelligently and in non-trivial ways to the user. It provides a paradigm for research and development which combines aspects of both databases and artificial intelligence technologies. A prototype system has shown the viability of this approach. The author focuses on the following database issues : (1) Descriptions are used as semantic templates for associatively accessing and manipulating data objects; (2) Dynamic views minimize the typical distinctions between queries and retrievals, and between views and real data, and thereby increase the perceived immediacy of the user interface; and (3) Constraint Equations are developed as a declarative representation for semantic constraints. The uniform approach they provide for expressing database integrity, consistency, and more general semantics derives its power from the rule-based framework of recent A.I. expert systems. The efficiency of constraint maintenance also is considered. Lastly, (4) The notion of binding time of data associations and reference is discussed relative to both the choice of data model and to the method of data access. Author (GRA)

N84-19178# California Univ., Berkeley. Lawrence Berkeley Lab.
USER'S MANUAL FOR THE DOE TECHNICAL INFORMATION CENTER INTEGRATED RECORD INPUT SYSTEM (IRIS)
J. Dennis Lawrence and Todd Hammond Mar. 1983 83 p
(Contract DE-AC03-76SF-00098)
(DE83-013074; DOE/TIC-11616; LBL-15731) Avail: NTIS HC A05/MF A01

The use of the Integrated Record Input System (IRIS) which is developed fo the DOE Technical Information Center is outlined. The interaction with the various programs in the DOE/TIC integrated record input system (IRIS) examined. Specifics of using each program are discussed. DOE

N84-19179# European Space Agency, Paris (France).
THE APOLLO CONCEPT: ELECTRONIC DOCUMENT DELIVERY BY SATELLITE
Apr. 1983 113 p refs
(ESA-SP-1048; EUR-8589-EN) Avail: NTIS HC A06/MF A01

Electronic document delivery via the European Communications Satellite, the Apollo system, is described. Document indentification and ordering; Apollo operation; document digitization; characteristics of the products; transmission errors and image quality; the document terminal; the archive; and the satellite transmission system are outlined. Author (ESA)

N84-19180# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
AN ENGINEERING DATA MANAGEMENT SYSTEM FOR COMPUTER AIDED DESIGN
F. J. Heerema and H. vanHedel (Control Data B.V., Rijswijk, Netherlands) Nov. 1982 26 p refs Presented at 3rd Intern. Conf. and Exhibition on Eng. Software, London, 11-13 Apr. 1983
(NLR-MP-82050-U) Avail: NTIS HC A03/MF A01

The Engineering Data Interactive Presentation and Analysis System (EDIPAS), a tool for both data management and data analysis and presentation is described. The data management part has a utility to initialize a project database; input programs to load data from files into the database under user control; utilities to dump parts of the database to off-line devices and to reload data stored in this way; and routines to extract data from and to load data into the database. The data analysis and presentation part has a command-driven interactive subsystem with functions to select information, to build curves and arrays of curves, to smooth and to interpolate, to define and to display graphs with user-controlled layout and annotation, and to define tables and layout for printed reports. Commands may be grouped and edited to parametric procedures, which can be stored in the database. Author (ESA)

N84-19181# National Library of Medicine, Bethesda, Md. Bibliographic Services Div.
MEDICAL SUBJECT HEADINGS, TREE ANNOTATIONS, 1984. TECHNICAL NOTES, MEDLARS INDEXING INSTRUCTIONS
Thelma Charen 1983 126 p
(PB84-120047; NLM-MED-83-08) Avail: NTIS HC A07/MF A01 CSCL 05B

Designed for medical indexers and searcher, MeSH Tree Annotations has a two-fold purpose: first, to give a general statement on the approach an indexer or searcher should pursue to a given tree, and second, to advise him of special features within that he should be aware of before indexing or searching. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-19182# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
ECONOMIC ANALYSIS MODEL PROGRAM USER'S MANUAL (BURROUGHS VERSION) Final Report
S. Becker Jun. 1983 57 p
(AD-A135950; DTNSRDC/CMLD-83/19) Avail: NTIS HC A04/MF A01 CSCL 05/3

An automated Economic Analysis Model computer program designed to aid equipment procurement decisions is described in this report. Net present value, equivalent uniform annual cost, break even points, and savings to investment ratio output are presented in graphical form. Sensitivity analyses presented include lease vs. procurement, varying recurring costs, and varying differential inflation rates. The program was originally developed in China Lake, California on a UNIVAC computer, but was converted by DTNSRDC to run on its Burroughs B7700 computer. Only the converted version is described in this report. Included, are references to the documentation of the original UNIVAC version of the program. Although the program was originally designed for equipment procurement, it was successfully used for an economic analysis of an automated data processing system. Author (GRA)

N84-19183# Civil Aeronautics Board, Washington, D.C.
ECONOMIC CASES OF THE CIVIL AERONAUTICS BOARD, VOLUME 101, APRIL 1983 TO MAY 1983
1983 934 p
(PB84-127695) Avail: NTIS HC A99/MF A01 CSCL 05C

Fitness investigations, services, and employee protection programs are considered. The argument presented by the contesting parties and the case rulings are included. GRA

N84-19184# Civil Aeronautics Board, Washington, D.C.
ECONOMIC CASES OF THE CIVIL AERONAUTICS BOARD, VOLUME 102, JUNE 1983 TO JULY 1983
1983 870 p refs
(PB84-127703) Avail: NTIS HC A99/MF A01 CSCL 05C

Fitness investigations, route transfers, and service proceedings are described. The arguments presented by the contesting parties and the case rulings are included. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-18259# Joint Publications Research Service, Arlington, Va.
PRAVDA SCORES US REACTION TO DRAFT TREATY ON USE OF FORCE IN SPACE
A. Sitnikov *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 86-89 Transl. into ENGLISH from Pravda (Moscow), 24 Sep. 1983 p 4 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

N84-18261# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL SPACE ORGANIZATIONS
Ye. P. Kamenetskaya and S. A. Nikitin *In its* USSR Rept.: Space (JPRS-USP-84-001) 26 Jan. 1984 p 92-98 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1983 p 23-27 (For primary document see N84-18247 09-12)
Avail: NTIS HC A06

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-19185*# Cleveland State Univ., Ohio. Dept. of Electrical Engineering.
OPTIMIZATION METHODS APPLIED TO HYBRID VEHICLE DESIGN Final Report
John F. Donoghue and James H. Burghart Jun. 1983 180 p refs
(Grant NAG3-84; Contract DE-AI01-77CS-51044)
(NASA-CR-168292; DOE/NASA-0084/1; NAS 1.26:168292) Avail: NTIS HC A09/MF A01 CSCL 13F

The use of optimization methods as an effective design tool in the design of hybrid vehicle propulsion systems is demonstrated. Optimization techniques were used to select values for three design parameters (battery weight, heat engine power rating and power split between the two on-board energy sources) such that various measures of vehicle performance (acquisition cost, life cycle cost and petroleum consumption) were optimized. The apporach produced designs which were often significant improvements over hybrid designs already reported on in the literature. The principal conclusions are as follows. First, it was found that the strategy used to split the required power between the two on-board energy sources can have a significant effect on life cycle cost and petroleum consumption. Second, the optimization program should be constructed so that performance measures and design variables can be easily changed. Third, the vehicle simulation program has a significant effect on the computer run time of the overall optimization program; run time can be significantly reduced by proper design of the types of trips the vehicle takes in a one year period. Fourth, care must be taken in designing the cost and constraint expressions which are used in the optimization so that they are relatively smooth functions of the design variables. Fifth, proper handling of constraints on battery weight and heat engine rating, variables which must be large enough to meet power demands, is particularly important for the success of an optimization study. Finally, the principal conclusion is that optimization methods provide a practical tool for carrying out the design of a hybrid vehicle propulsion system. Author

88 SPACE SCIENCES (GENERAL)

N84-19186*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GODDARD SPACE FLIGHT CENTER CONTRIBUTIONS TO THE UNIVERSITY OF CALIFORNIA, SANTA CRUZ SUMMER WORKSHOP ON HIGH ENERGY TRANSIENTS
Oct. 1983 61 p refs Workshop held 11-22 Jul. 1983 Submitted for publication
(NASA-TM-86050; NAS 1.15:86050) Avail: NTIS HC A04/MF A01 CSCL 03B

Topics addressing the characteristics and emission mechanisms of gamma ray bursts and neutron and gamma ray emission from solar flares are discussed. In addition, observational aspects of gamma ray astronomy are addressed with particular attention given to optical transients associated with gamma ray bursts. For individual titles, see N84-19187 through N84-19193.

N84-19187*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEUTRONS AND GAMMA RAYS FROM SOLAR FLARES c92
R. Ramaty and R. J. Murphy *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 13 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

The theory of neutron and gamma-ray production in flares is reviewed and comparisons of the calculations with data are made. The principal conclusions pertain to the accelerated proton and electron numbers and spectra in flares and to the interaction site of these particles in the solar atmosphere. For the June 21, 1980 flare, from which high-energy neutrons and high-energy (> MeV) photons were seen, the electron-to-proton ratio is energy dependent and much smaller than unity at energies greater than 1 MeV. The interaction site of these particles appears to be the solar chromosphere. M.G.

N84-19188*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY BURSTS: A 1983 OVERVIEW c93
T. L. Cline *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 10 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

Gamma ray burst observations are reviewed with mention of new gamma-ray and optical transient measurements and with discussions of the controversial, contradictory and unresolved issues that have recently emerged: burst spectra appear to fluctuate in time as rapidly as they are measured, implying that any one spectrum may be incorrect; energy spectra can be obligingly fitted to practically any desired shape, implying, in effect, that no objective spectral resolution exists at all; burst fluxes and temporal quantities, including the total event energy, are characterized very differently with differing instruments, implying that even elementary knowledge of their properties is instrumentally subjective; finally, the log N-log S determinations are deficient in the weak bursts, while there is no detection of a source direction anisotropy, implying that Ptolemy was right or that burst source distance estimates are basically guesswork. These issues may remain unsolved until vastly improved instruments are flown. M.G.

N84-19189*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPECTRAL PROPERTIES OF GAMMA-RAY BURSTS: A REVIEW OF RECENT DEVELOPMENT c93
B. J. Teegarden *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 15 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

Developments in the spectroscopy of gamma ray bursts (GRB) are reviewed. The general question of the validity of the spectral results, particularly with regard to features in the spectrum, is discussed. Confirmations of these spectral features are summarized. Results from the KONUS experiments on Venera 13 and 14 are reviewed. The status of models of the continuum spectrum is summarized. A number of different radiation mechanisms appear capable of fitting the data. These include thermal bremsstrahlung, thermal synchrotron and inverse Compton. Rapid variability of the spectra shape on time scales < 0.25 sec. was reported. The characteristic energy of the spectrum was observed to vary over nearly an order of magnitude during individual events. A strong correlation between spectral hardness and luminosity was found. Low-energy (50 keV) absorption features and high-energy

(400 keV) emission features continue to appear in GRB spectra. Understanding the origin of these lines in the context of the existing continuum models remains a difficult problem. M.G.

N84-19190*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FREQUENCY OF FAST, NARROW GAMMA-RAY BURSTS AND BURST CLASSIFICATION c93
J. P. Norris, T. L. Cline, U. D. Desai, and B. J. Teegarden *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 6 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

Evidence from the Vela satellites that very brief, approximately 0.1 s, gamma-ray bursts constitute a class distinct from the longer, highly structured bursts has been strengthened by the results of the Venera 11 and 12 KKONUS experiments. The Goodard ISEE-3 gamma-ray burst spectrometer, utilizing a trigger criterion which is more likely to be independent of duration than previous experiments, detected a sample of events which enhances this bimodal distribution. The ISEE-3 result is corroborated by an increase in the frequency of detection of short bursts in the KONUS 13/14 database over KONUS 11/12, an effect attributable to the use of a shorter trigger integration time in the later experiments. Considerations such as repeating bursters complicate a simple dichotomous classification of gamma-ray bursts. M.G.

N84-19191*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EQUILIBRIA IN STRONGLY MAGNETIZED PAIR PLASMAS c75
Alice K. Harding *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 4 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 20I

Positron-electron pair densities for a thermal plasma in the steady-state equilibrium where pair production balances pair annihilation are found as a function of temperature kT / mc(2) approx. < 1, source size R and magnetic field strength B. When the plasma is strongly magnetized, B > 10(12) G, the important processes are synchrotron radiation, one-photon (magnetic) pair production and two-photon pair annihilation. An analytic solution for the equilibrium pair density, found under certain simplifying assumptions, shows that optically thin equilibria exist only for sufficiently small source sizes. M.G.

N84-19192*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPLICATIONS OF THE THREE GRB OPTICAL FLASHES c93
B. E. Schaefer *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 3 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

The implications of three optical transients associated with gamma ray bursts are discussed. Data on the duration, fluence, E sub gamma/E sub opt, optical recurrence time scale, presence of optical precursors or afterflows, and the identification of quiescent gamma ray burst candidates are addressed. M.G.

N84-19193*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RAPIDLY MOVING TELESCOPE: AN INSTRUMENT FOR THE PRECISE STUDY OF OPTICAL TRANSIENTS c74
B. J. Teegarden, T. T. vonRosenvinge, T. L. Cline, and R. Kaipa *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 7 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 20F

The development of a small telescope with a very rapid pointing capability is described whose purpose is to search for and study fast optical transients that may be associated with gamma-ray bursts and other phenomena. The primary motivation for this search is the discovery of the existence of a transient optical event from the known location of a gamma-ray bursts. The telescope has the capability of rapidly acquiring any target in the night sky within 0.7 second and locating the object's position with + or - 1 arcsec accuracy. The initial detection of the event is accomplished by the MIT explosive transient camera or ETC. This provides rough pointing coordinates to the RMT on the average within approximately 1 second after the detection of the event. M.G.

N84-19194# Netherlands Committee for Geophysics and Space Research, Amsterdam.
SPACE RESEARCH IN THE NETHERLANDS Annual Report, 1982
1982 86 p refs
Avail: NTIS HC A01/MF A01

Solar and stellar space research, cosmic ray, photometry, and satellite geodesy projects are summarized. Impulsive burst heating, a chromospheric explosion, and convection in a solar flare were studied using hard X-ray imaging spectrometer data. The ISEE 3 satellite was reprogrammed to study the magnetotail. A cataclysmic variable star was observed. Coronal and chromospheric activity of F, G, and K stars was investigated. Work on EXOSAT, the Coded Mask Imaging Spectrometer for Salyut 7, Hipparcos, and the International Solar Polar Mission continued. The COS-B gamma ray data were analyzed. The IRAS was launched and a balloon infrared astronomical platform was flown. A Josephson receiver with an overall noise temperature of 500 K (single side band) at 185 GHz was developed. Mobile laser range finders were studied. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-19195*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRAL VARIABILITY IN EARLY-TYPE BINARY X-RAY SYSTEMS
Richard McCray, Timothy R. Kallman, John I. Castor (California Univ., Lawrence Livermore Lab.), and Gordon L. Olson (Los Alamos Scientific Lab., N. Mex.) Jan. 1984 49 p refs Submitted for publication
(Grants NsG-7128; NSF AST-80-19874)
(NASA-TM-86060; NAS 1.15:86060) Avail: NTIS HC A03/MF A01 CSCL 03A

Theoretical models for the ionization of trace elements in a strong stellar wind by a compact binary X-ray source and for the resulting orbital phase dependence of the emergent soft X-ray spectra and the profiles of ultraviolet resonance lines are presented. Model results agree qualitatively with the X-ray and ultraviolet spectra of the system 4U 0900-40/HD 77581 and explain the suppression of the absorption profiles of the Si IV upsilon 1394 and C IV upsilon 1548 lines when the X-ray sources is in front of the star. The model predicts that the absorption profiles of the N V upsilon 1239 and O VI upsilon 1032 lines will be enhanced rather than suppressed during this orbital phase. We predict phase-dependent linear polarization in the resonance lines profiles. Future observations of these phase dependent effects in early-type binary X-ray systems may be used to investigate the dynamics of stellar winds and their interactions with the X-ray source. Author

N84-19196# European Space Agency, Paris (France).
STATISTICAL METHODS IN ASTRONOMY
E. J. Rolfe, comp. Nov. 1983 279 p refs Partly in ENGLISH and FRENCH Proc. of Intern. Colloq., Strasbourg, France, 12-16 Sep. 1983 Sponsored by Observatoire de Strasbourg, France, ESA and Institut National d'Astronomie et de Geophysique (INAG)

(ESA-SP-201; ISSN-0379-6566) Avail: NTIS HC A13/MF A01

Astronomical data set description methods; time series analysis; classification methods; prediction methods; and estimation methods were discussed. Least squares methods, maximum likelihood estimates; stellar spectrophotometry; discriminant analysis; periodic variations; and clustering were covered. For individual titles, see N84-19197 through N84-19239.

N84-19197# Innsbruck Univ. (Austria). Inst. fuer Aeronomie.

DATA SET DESCRIPTION AND BIAS

Joerg Pfleiderer *In* ESA Statist. Methods in Astron. Nov. 1983 p 3-11 refs Sponsored by Austrian Fonds (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

The qualities of astronomical observations - ranging from good measurements with a definite result and negligible error to upper limits or even no result at all - and their relevance to data sets are considered, as well as the contraction of data sets to their essential contents and the evaluation of intrinsic data. Maximum likelihood methods are illustrated, using deconvolution methods. Parameters and parameter spaces, incompleteness, bias, selection, and the role of data quality on biases are considered. Principal component analysis and its role in detecting biases, and a method to statistically remove biases, in particular the observational magnitude cut-off bias, are discussed recipes for avoiding undetected biases are outlined. Author (ESA)

N84-19198# Space Telescope Science Inst., Baltimore, Md.

CLUSTERING PROPERTIES OF STARS OUTSIDE THE GALACTIC DISK

A. Fresneau *In* ESA Statist. Methods in Astron. Nov. 1983 p 17-20 refs (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

Statistical estimators were applied to evaluate star clumping (apparent or real) at short distance scale (a few arcmin) and its influence on the overall probability that a star may be rejected by Space Telescope guidance sensors due to proximity of another star less than 1 arcmin and 0.5 magnitude distant. Four star fields of 313.5 sq area deg at galactic latitude 83, 50, -40 deg, complete up to the same photographic magnitude limit of 12.7, show clustering at distance scale < 2 arc min, according to the nearest neighbor distribution. The strongest effect is detected at the north galactic pole where heterogeneity of the star density is doubtful. The variogram of the magnitude difference of the close binaries in this sample is related to angular separation. Author (ESA)

N84-19199# Milan Univ. (Italy). Dept. di Fisica.

APPLICATION OF MULTIVARIATE ANALYSIS TO THE PARAMETERS OF PARAMETERS OF ASTROPHYISCAL OBJECTS

M. Fracassini, G. Manzotti, L. E. Pasinetti, G. Raffaelli, E. Antonello (Osservatorio Astronomica di Brera, Milan), and L. Pastori (Osservatorio Astronomica di Brera, Milan) *In* ESA Statist. Methods in Astron. Nov. 1983 p 21-25 refs (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

Canonical correlations, factor analysis and discriminant analysis were applied to observartions of ultrashort period cepheids; stars in the photometric system of the Geneva Observatory; pulsars; and globular clusters. The homogeneity of atmospheric pulsations related to the common birth or to the longer lived quasi homogeneous evolution of the Cepheids was analyzed. The capability of a photometric system to separate stellar groups, to reveal their discriminating physical characteristics and to optimize the combination of correlated colors in the groups was determined. The characteristics of pulsars in an empirical diagram of astrophysical objects, their differentiating physical parameters, and the anisotropy in their galactic distribution were ascertained. The physical characteristics of stellar clusters, the galactic gradients of their observed parameters, and the distribution of galactic clusters were obtained. Author (ESA)

N84-19200# Osservatorio Astronomico, Trieste (Italy).

AN AUTOMATIC FITTING PROCEDURE FOR COMPARING OBSERVED AND COMPUTED SPECTRAL DISTRIBUTIONS

M. L. Malagnini and C. Morossi *In* ESA Statist. Methods in Astron. Nov. 1983 p 27-30 refs (For primary document see N84-19196 09-89)

(Grant MPI-FD7)

Avail: NTIS HC A13/MF A01

An automatic fitting procedure based on a least squares optimization algorithm, for comparing, on the basis of objective criteria, observed and computed spectral energy distributions is presented. It can be used to derive the atmospheric parameters of stars. The availability of large-memory computers and the availability of observational and theoretical data on flexible computer-compatible supports make it possible to apply such a procedure to large sets of observations in very short times. Author (ESA)

N84-19201# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).

THE FLUCTUATION SPECTRUM OF MOLECULAR CLOUDS

Lars G. Stenholm *In* ESA Statist. Methods in Astron. Nov. 1983 p 31-32 refs (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

Turbulence in interstellar molecular clouds was studied using Fourier transforms of line parameters from CO isotopes. The studied cloud is found to be turbulent, i.e., the spectral indexes of the power spectra are consistent with the Kolmogoroff law. The column density of a fluctuation increases with increasing size. Thermal variations are controlled by the dominant coolant 12CO. Author (ESA)

N84-19202# Tartu State Univ. (USSR). Inst. of Astrophysics and Atmospheric Physics.

PHASE DISPERSION MINIMIZATION METHODS FOR ESTIMATION OF PERIODS FROM UNEQUALLY SPACED SEQUENCES OF DATA

J. Pelt *In* ESA Statist. Methods in Astron. Nov. 1983 p 37-42 refs (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

Fourier transform methods, least squares estimation methods and phase dispersion minimization methods are compared. For astronomial data, it is demonstrated that phase dispersion methods out-perform the others. It is possible to construct more sensitive statistics than with Fourier transform methods. Least squares methods require more computer run time. The phase dispersion methods can be used to simulate the other two. Author (ESA)

N84-19203# Crimean Astrophysical Observatory (USSR).

EVALUATION OF THE SIGNIFICANCE OF THE DATA ON THE 160.01 MIN OSCILLATIONS OF THE SUN TREATED BY THE SUPERPOSED EPOCH ANALYSIS

D. N. Rachkovsky *In* ESA Statist. Methods in Astron. Nov. 1983 p 43-44 refs (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

Means of evaluating the statistical significance of data treated by the superposed epoch method are discussed. It is shown that data quasi-persistency affects the significance criterion more strongly than is commonly assumed. Preliminary averaging of epochs and the use of significance criterion based on Fourier amplitudes permits the quasi-persistency of data to be ignored. The results of a search for quasi-persistency in the 160m.01 period oscillations of the Sun are presented. No quasi-persistency is found. The hypothesis that the amplitude of 160m.01 oscillations is the result of random sequentially independent and normally distributed data, is rejected with a significance level of the order of 10 to the minus 17th to minus 15th power. Author (ESA)

N84-19204# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

CLASSIFICATION METHODS: AN INTRODUCTORY SURVEY

Michael J. Kurtz *In* ESA Statist. Methods in Astron. Nov. 1983 p 47-58 refs Sponsored by Smithsonian Scholarly Studies Program (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

The design of classification procedures for solving physical problems is introduced, emphasizing the effects of systematic error. Multivariate analysis, factor analysis (principal component analysis), discriminant analysis, multidimensional scaling, cluster analysis and syntactic pattern recognition are discussed. Possibilities for classification of galactic clusters are indicated.
Author (ESA)

N84-19205# Observatoire de Strasbourg (France).
PRELIMINARY RESULTS OF A STATISTICAL CLASSIFICATION OF ULTRAVIOLET STELLAR SPECTRA
Daniel Egret and Andre Heck (ESA, Madrid) *In* ESA Statist. Methods in Astron. Nov. 1983 p 59-63 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Results of a statistical analysis of low dispersion stellar IUE spectra, based on normalized flux values at 16 wavelengths are presented. Principal component analysis, Euclidean cluster analysis, and single and complete linkage clustering methods are discussed, and a classification procedure is proposed.
Author (ESA)

N84-19206*# Space Telescope Science Inst., Baltimore, Md.
ASTRONOMICAL AND STATISTICAL ALGORITHMS USED IN THE SPACE TELESCOPE GUIDE STAR SELECTION SYSTEM
Helmut Jenkner *In* ESA Statist. Methods in Astron. Nov. 1983 p 65-68 refs (For primary document see N84-19196 09-89)
(Contract NAS5-26555)
Avail: NTIS HC A13/MF A01

The construction of the Space Telescope Guide Star Catalog from digitized Schmidt survey plates covering the entire sky is described. In order to provide sufficient pointing information, the Guide Star Selection System has to contain a catalog of 20 million guide star candidates in the range of 9.0 to 14.5 visual magnitudes. An image inventory process extracts the relevant object data; after photometric and astrometric calibration the data are screened to arrive at suitable guide star candidates. The selection process for a given target takes into account geometric and photometric parameters of the field, scheduling information, and acquisition probabilities for each guide star pair. Author (ESA)

N84-19207# Osservatorio Astronomico, Trieste (Italy).
A CLASSIFICATION ALGORITHM FOR STAR-GALAXY COUNTS
M. L. Malagnini *In* ESA Statist. Methods in Astron. Nov. 1983 p 69-72 refs (For primary document see N84-19196 09-89)
(Grant MPI-FD7)
Avail: NTIS HC A13/MF A01

A methodology for image classification developed for faint object discrimination on photographic plates is presented. It is based on the description of textural properties characterizing different categories of objects by gray-tone spatial-dependence matrices. Such matrices are computed from quantized digital subimages centered on the objects to be classified and including a convenient region of surrounding background. Statistical analyses of the co-occurrence matrices referring to preselected training sets of images permit the definition of the classification parameters. The final assignment of each object to a given class is based on objective criteria. The overall procedure requires reasonably short computation times, so that automatic classification of very large samples of objects is feasible. Author (ESA)

N84-19208# Bonn Univ. (West Germany). Observatorium Hoher List.
THE MANIFOLD OF SPHEROIDAL GALAXIES
F. T. Lentes *In* ESA Statist. Methods in Astron. Nov. 1983 p 73-76 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A sample of 24 elliptical and a sample of 25 SO galaxies with known velocity dispersions and rotation curves are investigated by principal component analysis. Error estimates for the factor loadings due to observational uncertainties are given. Results show that for both samples the manifold's true dimension is two. A third significant factor is the unknown inclination. The global properties of ellipticals and SO galaxies are compared with each other. Author (ESA)

N84-19209# Innsbruck Univ. (Austria). Inst. fuer Astronomie.
CORRECTION OF DATA-QUALITY INDUCED BIAS
Joerg Pfleiderer *In* ESA Statist. Methods in Astron. Nov. 1983 p 77-79 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A minimum information method which implements incomplete data into distributions and thus removes a bias caused by the different quality of data is described. The data input form is illustrated. The nonlinear set of equations for the distribution probabilities can only be solved numerically. The relation of the method to principal component analysis is outlined. Author (ESA)

N84-19210# Universite des Sciences et Techniques du Languedoc, Montpellier (France).
A CLUSTER ANALYSIS OF VISUAL AND NEAR-INFRARED LIGHT CURVES OF LONG PERIOD VARIABLE STARS
M. O. Mennessier *In* ESA Statist. Methods in Astron. Nov. 1984 p 81-84 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Cluster analyses of 206 light curves corresponding to variations in V magnitude of mira-type variable stars, and light curves of 81 miras from photometric measurements were performed. Analyses of visual and near infrared curves show the importance of the molecular bands for distinguishing different popoulations among mira-type variables. The spectral type near the minimum luminosity is correlated with the shape of the light curves.
Author (ESA)

N84-19211# Observatoire de Besancon (France).
APPLICATION OF MAXIMUM LIKELIHOOD AND MONTE CARLO METHODS TO LOCAL STUDIES OF STELLAR VELOCITY FIELDS [APPLICATION DES METHODES DU MAXIMUM DE VRAISEMBLANCE ET DE MONTE CARLO A L'ETUDE LOCALE DU CHAMP DES VITESSE STELLAIRES]
E. Blak *In* ESA Statist. Methods in Astron. Nov. 1983 p 85-89 refs In FRENCH (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

The gradients of the ellipsoid of residual velocity in the galactic plane in the directions of the center and of galactic rotation are calculated. A maximum likelihood algorithm for the equations of motion and radial velocity is outlined. The resulting system of nonlinear equations is tackled by a Monte Carlo method, with random sampling of solutions. Successive sampling enables errors to be detected, avoiding the need for numerical simulation. A large number of unknown variables can be included. Author (ESA)

N84-19212# Osservatorio Astronomico, Padova (Italy).
AN AUTOMATIC PROCEDURE TO REDUCE A LARGE AMOUNT OF SPECTROPHOTOMETRIC DATA
Carlotta Bonoli *In* ESA Statist. Methods in Astron. Nov. 1983 p 93-96 (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

An interactive 300 kword program for spectrophotometric data reduction on the HP 1000 is presented. It analyzes data produced by several spectrophotometers based on solid state detectors. Program structure and principal routines are described. Astronomical examples are presented. A standard reduction takes 10 min.
Author (ESA)

N84-19213# Consiglio Nazionale delle Ricerche, Turin (Italy). Osservatorio Astronomico.
A STUDY OF THE WAKE-LIKE DISTORTIONS IN THE LIGHT CURVES OF RS CVN STARS BY MEANS OF TIME ANALYSIS
M. Busso and F. Scaltriti *In* ESA Statist. Methods in Astron. Nov. 1983 p 97-102 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Time series analysis techniques were applied to light curves

of RS CVn binaries. The procedure consists in reconstitution of uniformly sampled data by a least square fit in the frequency domain; and application of the cross correlation technique to find the phase displacement between light curves of different years. Assuming that the observed variations are due to dark spots, for RU Cnc and CQ Aur, evidence of the existence of a differential rotation and of a latitude drift of the spots similar to the solar ones is found. The relative parameters are computed.
Author (ESA)

N84-19214# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
DIFFERENTIAL ROTATION OF SOLAR BACKGROUND MAGNETIC FIELDS DURING THE 20TH SOLAR CYCLE
L. Hejna *In* ESA Statist. Methods in Astron. Nov. 1983 p 103-108 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Use of autocorrelation analysis for studies of the differential rotation of the solar background magnetic fields is demonstrated. Time series obtained from synoptic H alpha charts analysed. The distribution of the synodic angular velocity in time, during the cycle, and the heliographic latitude for (phi) smaller than 60 deg was determined. The parameters A and B from the relation for differential rotation omega = A + B sin sq phi were determined for the entire cycle and for individual Carrington rotations.
Author (ESA)

N84-19215# Wroclaw Univ. (Poland). Astronomical Inst.
EVALUATION OF THE QUALITY OF PREDICTIONS IN THE CASE OF A VARIABLE WITH STRONGLY ASYMMETRIC DISTRIBUTION
M. Jakimiec *In* ESA Statist. Methods in Astron. Nov. 1983 p 109-115 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Quantitative evaluation of the quality of predictions is investigated, with the case of short term solar flare predictions. Strong asymmetry of the predicted variable distribution is characteristic. Prediction evaluation is based on the deviation distribution f(v) (v=forecasted value minus occurred value). The method focuses on the degree of concentration of the deviations around the value v=0. For good predictions f(v) should be symmetric since its asymmetry indicates systematic bias (overestimated or underestimated predictions). Investigating by statistical tests whether the degree of concentration of f(v) is large enough, reliable criteria of good quality of predictions were obtained. Efficiency of this criterion, and of the whole method, is demonstrated by examples of flare predictions.
Author (ESA)

N84-19216# Liege Univ., Cointe-Ougree (Belgium). Dept. d'Astrophysique.
COMPARATIVE STUDY OF PERIOD DETERMINATION METHODS
J. Manfroid, A. Heck (Strasbourg Univ., France), and G. Mersch *In* ESA Statist. Methods in Astron. Nov. 1983 p 117-121 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Fourier's, Lafler-Kinman's and Stellingwerf's period determination algorithms were compared using simulated astronomical (photometry) data. The application to single-periodic phenomena shows that none of the methods is clearly superior to the others. Fourier's and the nonparametric methods have different scopes and are complementary.
Author (ESA)

N84-19217# Liege Univ., Cointe-Ougree (Belgium). Dept. d'Astrophysique.
STATISTICAL DETERMINATION OF THE PRECISION OBTAINED BY A PHOTOMETRIC REDUCTION ALGORITHM
J. Manfroid and A. Heck (Strasbourg Univ., France) *In* ESA Statist. Methods in Astron. Nov. 1983 p 123-124 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Numerical simulations were used to assess the multinight technique for UV by photometric data reduction. Observation sets were created for 1, 2, 4, 8 and 16 nights. The standard values were assumed to be accurate to 0.004 magn. and the error in the measurements was 0.006 magn. A total of 20 standard stars were kept, along with 20 constant stars, giving an average of 16 stars every night. Analysis shows that the multinight procedure leads to a dramatic improvement in the precision of the results.
Author (ESA)

N84-19218# Consiglio Nazionale delle Ricerche, Turin (Italy).
THE INFLUENCE OF SOLAR ACTIVITY ON EARTH'S ROTATION: PROBLEMS OF A BIVARIATE ANALYSIS **c92**
G. Picchio *In* ESA Statist. Methods in Astron. Nov. 1983 p 125-131 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

The relation between the Wolf numbers and the change in length of day was explored by univariate and bivariate analysis. The correlations found are low both in time and in frequency domain. The low coherency and few degrees of freedom in the spectrum estimates lead to large variances in the basic indicators. The results of the hypothesis of a linear input-output relation between the two phenomena are given. A large percentage of power in the changes of the Earth's rotation seems to come from sources other than solar activity.
Author (ESA)

N84-19219# Observatoire de Strasbourg (France).
PREDICTIONS: ALSO AN ASTRONOMICAL TOOL
Andre Heck *In* ESA Statist. Methods in Astron. Nov. 1983 p 135-143 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Techniques for astronomical model elaboration are reviewed, especially regression methods. Theoretical work and coded algorithms are indicated. Prediction of MK spectral classifications from uvby photometric data is compared to related studies, such as the photometric-box concept. Prediction, assimilation, and detection methods are distinguished.
Author (ESA)

N84-19220# Osservatorio Astronomico, Brera, Milan (Italy).
SOME APPLICATIONS OF MULTIPLE REGRESSION ANALYSIS **c65**
E. Antonello *In* ESA Statist. Methods in Astron. Nov. 1983 p 145-148 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A method for detecting nonlinear relations between a dependent and a combination of independent variables is presented. Applications of the method to delta Scuti variables amplitude increase with period are discussed. Gaussian elimination is used to solve the normal equations, and gives the intermediate regression equations. These are solved by operating on the correlation matrix. This is an extremely large matrix, since there may be hundreds of independent variables, but only selected rows are analyzed, to find significant variables via their correlation coefficients.
Author (ESA)

N84-19221# Observatoire de Strasbourg (France).
PREDICTION OF SPECTRAL CLASSIFICATION FROM PHOTOMETRIC DATA. APPLICATION TO THE MK SPECTRAL CLASSIFICATION AND THE GENEVA PHOTOMETRIC SYSTEM **Progress Report** **c74**
Daniel Egret and Andre Heck *In* ESA Statist. Methods in Astron. Nov. 1983 p 149-150 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Statistical methods in prediction of MK classification from photometric indices (Geneva system) are reviewed. Principal component analysis of photometric data, clustering around moving centers, and multiple stepwise regression techniques are discussed.
Author (ESA)

N84-19222# Michigan Univ., Ann Arbor.
CLUSTER ANALYSIS OF RARE EARTHS IN STELLAR SPECTRA
C. R. Cowley *In* ESA Statist. Methods in Astron. Nov. 1983 p 151-154 refs Prepared in cooperation with Dominion Astrophysi-

cal Observatory, Victoria, British Columbia (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A cluster analysis using parameters from wavelength coincidence statistics (WCS) of stars with lines of the second spectra of lanthanide rare earths is performed. Magnetic Ap stars with atypical spectral patterns are well separated in parameter space from the other clusters, as expected. It is shown that rare-earth patterns in magnetic Ap stars are more closely related to those of Am stars than to their magnetic congeners. The similarity of WCS parameters of normal and peculiar late-type stars to those of CP stars is noted, and it is suggested that these objects cluster closely because the abundance patterns are similar. Author (ESA)

N84-19223# Osservatorio Astronomico, Brera, Milan (Italy).
DISCRIMINANT ANALYSIS IN ASTRONOMY
E. Antonello, M. Fracassini (Milan Univ.), G. Manzotti (Milan Univ.), L. E. Pasinetti (Milan Univ.), L. Pastori, and G. Raffaelli (Milan Univ.) *In* ESA Statist. Methods in Astron. Nov. 1983 p 155-159 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Discriminant analysis is introduced, and results of application to delta Scuti variables, nonvariable stars, and the Oosterhoff groups of globular clusters are shown. Discriminant analysis weighs and linearly combines parameters so that groups become as statistically distinct as possible. Application to delta Scuti and nonvariables does not give good results. Separation of globular clusters containing RR Lyrae variables into two Oosterhoff groups is found to depend on metallicity. A 100% separation of 33 clusters with known radial velocity is achieved. Author (ESA)

N84-19224# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
MEASUREMENTS IN THE PRESENCE OF NONWHITE NOISE **c74**
R. Papoular and B. Pegourie *In* ESA Statist. Methods in Astron. Nov. 1983 p 161-165 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

The effects of atmospheric emission and absorption fluctuations on visible and infrared astronomical spectrophotometry are discussed. The running average and variance of emission and absorption spectra, and their relationships to the noise autocovariance are discussed. It is shown that the statistics are affected by integration time, interval between measurements and total length of observation time. Author (ESA)

N84-19225# Naval Observatory, Washington, D. C.
PREDICTING VARIATIONS IN EARTH ROTATION **c46**
Alice K. Babcock and Dennis D. McCarthy *In* ESA Statist. Methods in Astron. Nov. 1983 p 167-171 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Criteria which predictions of variations in UT 1-UTC must meet are summarized and the prediction technique is outlined. Factors involved in developing a physical model of Earth rotation are described and it is shown that the only available approach to time prediction is through statistical modelling. A prediction technique based on autogressive integrated moving average (ARIMA) modelling is also described, and compared with the current technique. With the ARIMA technique it is possible to predict 100 days ahead with no loss of accuracy. Author (ESA)

N84-19226# Royal Observatory, Edinburgh (Scotland).
DRIFT ANALYSIS: A FORGOTTEN TECHNIQUE
S. V. M. Clube *In* ESA Statist. Methods in Astron. Nov. 1983 p 173-176 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

It is suggested that a priori judgements may generally still be of greater significance in the development of astronomical ideas than a posteriori statistics. The growth of ideas in stellar kinematics during the first half of this century is examined, and it is shown that the undiscussed change from Kapteyn's two stream hypothesis to Schwarzschild's ellipsoidal hypothesis represents a near perfect example of paradigm switch. It is argued that this switch has one-sided and far reaching implications for understanding of galaxies. Author (ESA)

N84-19227# Washington State Univ., Pullman.
ESTIMATION: COMMENTS ON LEAST SQUARES AND OTHER TOPICS **c64**
Thomas E. Lutz *In* ESA Statist. Methods in Astron. Nov. 1983 p 179-185 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Least squares methods are reviewed and estimators are described. Maximum likelihood estimates, method of moments, and Bayes estimators are described. Normal probability plots, testing the least squares fit, and statistical distribution functions are outlined. Author (ESA)

N84-19228# South African Astronomical Observatory, Sutherland.
CORRELATED ERRORS IN A FUNCTIONAL RELATIONSHIP: ESTIMATION OF THE COLOR TERM IN THE PERIOD LUMINOSITY-COLOR (PLC) FOR LONG MAGELLANIC CLOUDS (LMC) CEPHEIDS
L. A. Balona *In* ESA Statist. Methods in Astron. Nov. 1983 p 187-189 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

The period-luminosity color (PLC) relationship for classical cepheids in the LMC is studied as an example of the estimation of parameters in a functional relationship when two of the variables have correlated errors. The correlation arises through the reddening corrections. The problem is soluble only if the variances of all but one of the variables are known or if their ratios can be determined. The color coefficient in the PLC relationship is practically unaffected by this effect unless the standard devition of the color excess is larger than what is considered to be an upper limit. Author (ESA)

N84-19229# Tartu Astronoomia Observatooriumi (USSR).
A METHODOLOGICAL LOOK AT ASTRONOMICAL STATISTICS IN THE LIGHT OF UNBIASED ESTIMATION
H. Eelsalu *In* ESA Statist. Methods in Astron. Nov. 1983 p 191-194 (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Methodological features of astronomical research are outlined in terms of statistical concepts. Statistical descriptive transformations characterizing galactic research are explained. Author (ESA)

N84-19230# Cambridge Univ. (England). Inst. of Astronomy.
INTERNAL CALIBRATION OF ASTRONOMICAL PHOTOGRAPHS **c35**
P. S. Bunclark and M. J. Irwin *In* ESA Statist. Methods in Astron. Nov. 1983 p 195-200 refs Sponsored by UK Science and Engineering Research Council (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A method for deriving a photographic magnitude index for stellar images that is linearly related to photoelectric magnitude is discussed. The areal profile of a star is assumed to be independent of magnitude, and is used to define a mapping function for placing isophotal magnitudes on the linear magnitude scale. This internally derived scale is reliably linear over the complete magnitude range of stellar images found on a photographic plate and therefore provides a simple means for extrapolating photoelectric sequences to faint magnitudes. The emulsion response and seeing profile of the atmosphere/plate/measuring system combination are also obtained. Author (ESA)

N84-19231# Astronomische Rechen-Institut, Heidelberg (West Germany).
ABSOLUTE MAGNITUDE CALIBRATION FOR RED DWARF STARS
Hartmut Jahreiss and Wilhelm Gliese *In* ESA Statist. Methods in Astron. Nov. 1983 p 201-203 refs (For primary document see N84-19196 09-89)

Avail: NTIS HC A13/MF A01

Red dwarf star absolute magnitude determination from spectral types and broadband color is described. The sample is restricted to stars with relative parallax error < 0.14 (= delta M < 0m.30). Calibration consists of elimination of known or suspected binaries, and of stars with combined colors or spectra; exclusion of stars with inexplicably large deviations, which may be caused by misprints or misidentifications; formation of groups of the same spectral class or nearly the same color; evaluation of the mean absolute magnitude of each group; and determination of a smoothed curve weighted according to the different numbers of stars included in the group means. The method provided photometric parallexes < or = 0'.040 for 90 stars with unknown distances. Author (ESA)

N84-19232# Royal Greenwich Observatory, Herstmonceux (England).
MAXIMUM-LIKELIHOOD ESTIMATION OF KINEMATIC PARAMETERS
C. A. Murray and P. M. Gilliver *In* ESA Statist. Methods in Astron. Nov. 1983 p 205-207 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A generalized maximum likelihood algorithm for determining star kinematic parameters and absolute magnitudes from observed proper motions, radial velocities and photometry is described. This takes account of correlation between stellar velocity components arising from an ellipsoidal distribution of residual velocities, as well as observational errors. Tests of the algorithm using synthetic data samples are described. For a stellar population with velocity dispersion on the order of 100 km/sec, the maximum likelihood estimators of absolute magnitude and its variance are highly correlated. Author (ESA)

N84-19233# Dunsink Observatory, Dublin (Ireland).
STATISTICAL PROBLEMS IN THE DETERMINATION OF THE COSMOLOGICAL DECELERATION PARAMETER QO **c90**
T. Kiang *In* ESA Statist. Methods in Astron. Nov. 1983 p 209-213 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

It is shown that luminosity evolution can be separated from statistical inferences on the deceleration parameter from an observed Hubble diagram. In all cases, determination is made assuming no evolution, and the results can then be corrected for any quantified evolution effect. It is shown that a likelihood approach to the statistical problem is feasible. A likelihood function that takes account of the condition that the residual in the absolute magnitude should be uncorrelated with the red shift is proved to be more effective than one that ignores this condition. It is proposed to combine the two likelihood functions. Author (ESA)

N84-19234# Massachusetts Inst. of Tech., Cambridge.
SELF AND CROSS TESTS OF ASTRONOMICAL HYPOTHESIS AND OPTIMAL CUTOFF BIAS-FREE NONPARAMETRIC ESTIMATION
I. E. Segal *In* ESA Statist. Methods in Astron. Nov. 1983 p 215-224 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A nonparametric method for the estimation of luminosity functions and similar astronomical parameters is given. The Malmquist bias is entirely removed, assuming the sample to be complete and the postulated cosmology to be correct, and all information in the data relevant to the luminosity function is extracted. The method is illustrated by consideration of the extragalactic magnitude - redshift relation and the comparative testing of alternative cosmologies. Computer simulations that determine the probability distributions of relevant statistics and eliminate the need for complex theoretical estimates of uncertain realistic applicability are described. Prediction of number counts is treated. Author (ESA)

N84-19235# Glasgow Univ. (Scotland). Dept. of Astronomy.
BIAS IN POLARIMETRIC ESTIMATORS
J. F. L. Simmons *In* ESA Statist. Methods in Astron. Nov. 1983 p 225-229 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Applying formal error techniques or results from linear model theory to nonlinear problems is discussed in relation to polarimetric modelling of binary stars. The least squares estimator for the inclination of the binary is shown to be severely biased towards high values when the signal to noise ratio is low, particularly for low inclinations. This biasing is obscured by selection effects that favor the detection of high inclination systems. Most close binary systems are known as such because they manifest spectrophotometric variations, but these are small when the binary inclination is low. Hence it is extremely probable that there is agreement between polarimetric and spectrophotometric determinations of binary inclinations, although this reflects no more than the noise level of polarimetric data. Methods of dealing with the bias in this estimation are discussed, stressing the importance of establishing confidence regions. Author (ESA)

N84-19236# Van Vleck Observatory, Middletown, Conn.
ON THE FREQUENCY OF WIDE PAIRS AMONG NEARBY DWARF STARS
A. R. Upgren and S. C. Chabotte *In* ESA Statist. Methods in Astron. Nov. 1983 p 231-232 refs (For primary document see N84-19196 09-89)
(Grant NSF AST-81-21463)
Avail: NTIS HC A13/MF A01

The possibility that the predicted number of chance pairings occurring among random space velocities of any sample of stars is affected by their nonuniform density in velocity space was studied. The velocity space of 171 K and M dwarfs was divided into volume elements whose star counts were compared with those predicted by a Poisson distribution, to test for randomness. Results for late-type dwarfs strongly suggest that a single velocity ellipsoid forms a satisfactory model for their motions and that no statistical evidence for wide pairs or triples is evident. Wide pairs appear to be at best a rare phenomenon in all but the very young stars and at worst nonexistent. Author (ESA)

N84-19237# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France). Centre de Mathematiques.
A SET FUNCTION APPROACH TO CLUSTER ANALYSIS **c65**
Hubert Emptoz and Robert Fages *In* ESA Statist. Methods in Astron. Nov. 1983 p 235-241 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

A set function approach to clustering, called scattering measure, for constructing signal processing algorithms is presented. Scattering measure is a real nonnegative valued set function, which can be used in pattern recognition as well as cluster analysis. A nonhierarchical divisive algorithm for use with the scattering measure is outlined. Author (ESA)

N84-19238# Lyon Univ. (France). Dept. de Mathematiques.
SOME ASPECTS IN PATTERN RECOGNITION **c64**
D. Tounissoux *In* ESA Statist. Methods in Astron. Nov. 1983 p 243-244 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

The sequential (pseudoquestionnaire) and nearest neighbor approaches to pattern recognition are summarized. Application domains are indicated. Author (ESA)

N84-19239# Strasbourg Univ. (France). Centre d'Etudes Statistiques.
SOME REMARKS ON SECOND ORDER STATIONARY PROCESS (OR WEAK STATIONARITY) **c64**
J. C. Turlot *In* ESA Statist. Methods in Astron. Nov. 1983 p 245-248 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

Time series analysis in spectrum estimation is outlined. The estimate of the spectral density function is based on the periodogram, but a consistent estimate is obtained by the convolution of the periodogram with a density function called a window. A

density function is obtained although the integrated spectrum is not differentiable. Author (ESA)

N84-19240*# Washington Univ., Seattle. Dept. of Astronomy.
A STUDY OF THE DISCREPANT QSO X-RAY LUMINOSITY FUNCTION FROM THE HEAO-2 DATA ARCHIVE Final Technical Report
Bruce Margon 23 Feb. 1984 34 p refs
(Grant NAG8-433)
(NASA-CR-173311; NAS 1.26:173311) Avail: NTIS HC A03/MF A01 CSCL 03A

An in-progress investigation aimed at characterizing the X-ray luminosity of very faint QSOs is described. More than 100 faint, previously uncataloged QSOs which lie in areas imaged in X rays at very high sensitivity were discovered. N.W.

N84-19241# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
PROCEEDINGS OF THE 16TH FINNISH ASTRONOMERS' DAYS
Seppo Urpo, ed. 1982 55 p refs Conf. held in Espoo, Finland, 12-13 Nov. 1981; organized by Finnish Astronomical Society
(Rept-S-129; ISBN-951-752-570-2) Avail: NTIS HC A04/MF A01

Cosmology, evolution of galaxies and stars, optical properties of stars, dark clouds, molecular line radiation, radio radiation of quasars, and instrumentation in astronomy were discussed. For individual titles, see N84-19242 through N84-19252.

N84-19242# Onsala Space Observatory (Sweden).
MILLIMETER RADIO ASTRONOMY AT ONSALA (SWEDEN)
Bernt Roennaeng *In* Helsinki Univ. of Technology Proc. of 16th Finn. Astronomers' Days 1982 p 3-9 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Research using a 25.6 m antenna radio telescope (18, 13, 10 and 6 cm receivers) and a 20 m radome enclosed radio telescope (1.3 cm to 2.5 mm) is summarized. Observations of maser emission with the circumstellar shell around late-type stars are described. Centimeter wave very long base interferometry investigations of quasar and radiogalaxy nuclei; compact hot spots in the extended lobes of distant objects; molecular maser sources; radio stars, solar flares, flares in other stars, and pulsars; global crustal dynamics; UT 1 and polar motion; extragalactic inertial frame; and links between the extragalactic frame and optical astrometric programs are suggested. Author (ESA)

N84-19243# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
SPECTRAL LINE RECEIVER FOR 80-90 GHz DESIGNED AT THE HELSINKI UNIVERSITY OF TECHNOLOGY
Antti V. Raeisaenen and Juhani K. Peltonen *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 10-13 ref (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

A cryogenic Schottky mixer receiver for 80 to 90 GHz was designed. For spectral line observations it is equipped with a phase locked local oscillator. Single sideband operation can be accomplished by tuning the sliding backshort of the waveguide mixer. Coupled to a 13.7 m diameter millimeter wave telescope, the receiver enables observations of spectral lines of SiO at 86.243 GHz, HCN at 88.632 GHz and HCO+ at 89.189 GHz.
Author (ESA)

N84-19244# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
DERIVATION OF THE PROPERTIES OF THE COSMIC BACKGROUND RADIATION FROM A STATIC WORLD MODEL c93
Toivo Jaakola *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 14-17 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Energy density, temperature, spectrum distorsion, photon-baryon number ratio, similarity with the local energy density, and anisotropy of the cosmic background radiation in a static, Euclidean, unevolving Universe are deduced. The data fit well the predictions. Author (ESA)

N84-19245# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
OBSERVATIONS OF VARIABLE MILLIMETER WAVE RADIO SOURCES AT METSAEHOVI
Martti Tiuri and Erkki Salonen *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 21-24 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Quasars were observed using a synchronous on-on method for weak sources and a five point method for strong sources. The theoretical sensitivity of the radiometer system was 90 mK. Results indicate that the flux density of OJ 287 (BL Lac-type object) increased rapidly in March-April 1981. The flux density of the Seyfert galaxy 3C 84 increased from November 1979 to February 1981, but after that the increase stops. The flux density of the quasar 3C 279 increased relatively slowly but clearly in 1981. The quasar 3C 345 has relatively rapid and large variations. Comparisons between results obtained at 37 and 22 GHz show that the flux density of the quasar 3C 273 grows in synchronism at both frequencies. A linear decrase in BL Lac from August 1980 to June 1981 is evident at 37 and 22 GHz. Author (ESA)

N84-19246# Helsinki Univ. of Technology, Espoo (Finland).
A HOMOLOGOUS MICROWAVE FLARE ON MAY 29, 1980 c92
Seppo Urpo *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 25-28 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Two homologous solar bursts were recorded at 1147 UT from the Hale region 16864. The measurements were done at 8 mm wavelength, frequency 37 GHz, using a 14 m radio telescope. The rise time of both bursts was about 10 sec and the peak flux density at 1028 UT was 3.3 sfu and at 1147 UT was 1.2 sfu. Both bursts were composed of several elementary spikes which were typically 3 sec apart from each other. The maximum of the gyrosynchrotron type spectrum was 16 GHz. The time profile of the bursts, elementary spikes and the frequency spectrum indicate that the origin of these homologous microwave bursts was in a magnetic structure with several loops and that the same complex loop structures was producing energy during both bursts.
Author (ESA)

N84-19247# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
SOLAR ROTATION RATE DETERMINED FROM MILLIMETER DATA c92
Harri Teraesranta *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 29-32 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Radio maps of the Sun were used to study the movements of microwave active areas. Long and short term rotation rates were deduced. The long term sidereal rotation rate 14.46 is (+ or - 0.11) - 2.66 (+ or - 0.76) sin sq B (deg/day) where B is the heliographic latitude and the errors are standard deviations of the least squares fit. This result was obtained by following the active areas for a complete rotation. The short term sidereal rotation rate is 13.34 (+ or - 0.09) - 0.59 (+ or - 0.69) sin sq B, obtained by following active areas for 3 to 7 days. The differences in rates are due to constant evolution of the active areas, which gives a significant variation in the short term rotation rate, but it is not very large when a complete rotation is examined, as active areas are not found far from sunspot groups. Author (ESA)

N84-19248# Turku Univ. (Finland).
THE FATE OF THE MAGELLANIC CLOUDS c90
Mauri Valtonen, Leena Taehtinen, and Kimmo Innanen (York Univ. Canada) *In* Helsinki Univ. of Technology Proc. of 16th Finn. Astronomers' Days 1982 p 33-35 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

It is argued that the Large Magellanic cloud is a companion

of the Galaxy, orbiting it in an orbit of decreasing size due to dynamical friction. Chandrasekhar's expression for dynamical friction indicates a relatively long merger time of the two galaxies unless the Galaxy possesses an extremely large and massive halo. Another type of dynamical friction due to three-body effects is several times more important than the classical two-body friction. Three-body friction causes a rapid decay of the orbit of the Large Magellanic Cloud independent of the model of the Galaxy. Models with extensive massive halos can be excluded. The Small Magellanic Cloud must be a temporary companion of the Large Magellanic Cloud. Author (ESA)

N84-19249# Turku Univ. (Finland). Observatory.
ORBITAL ECCENTRICITY IN A LOGARITHMIC POTENTIAL **c90**
Kimmo A. Innanen (York Univ., Canada), Leena Taehtinen, and Mauri J. Valtonen *In* Helsinki Univ. of Technology Proc. of 16th Finn. Astronomers' Days 1982 p 36-38 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

The eccentricity of particles moving in a logarithmic potential, as compared to the eccentricity in a Keplerian potential, was investigated in order to explain the nearly flat rotation curves of galaxies. To produce such a rotation curve, the mass of the galaxy must grow linearly with distance R from the galactic center. The gravitational potential must then be a logarithmic function of R. Numerical computations agree with analytic predictions to values of particle velocity (at right angles to the radius vector) = 1.4, after which the radially increasing mass of the logarithmic potential causes the two curves of eccentricity to converge. Author (ESA)

N84-19250# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
THE 433 EROS AND 624 HEKTOR. A PHYSICAL MODEL FOR TWO HIGHLY ELONGATED ASTEROIDS **c90**
Markku Poutanen *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 41-44 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Using the generalized radiative transfer theory developed for a nonspherical body, the light curve amplitudes of asteroids 433 Eros and 624 Hektor are studied. There exists a family of ellipsoidal models that match published observations. By using more than one apparition of an asteroid and phase curve information, the parameters of the model can be fixed.
Author (ESA)

N84-19251# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
CIRCULAR POLARIMETRY OF THE MAGNETIC COMPACT BINARY AM HERCULIS
Vilppu Piirola, Osmi Vilhu, and Ilkka Tuominen *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 46-49 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

Circular polarimetry in the red and simultaneous photometric observations in the UBVRI bands during the period June 1 to 3, 1981, of AM Herculis are discussed. Peak value of negative circular polarization (- 15 %) is stronger than observed in 1976 to 1979. Variations in the shape of the polarization and light curves occur from night to night. Positive crossover and reversal of the sign of the circular polarization are only marginal. Long term changes in polarization may be partly due to precession of the axis of rotation of the white dwarf about the binary axis. However, the duration of the phase interval where circular polarization remains close to zero changes on a time scale of days, casting doubt on precession models. The changing shape and position of the accretion columns with respect to the magnetic axis could explain short term variations. Author (ESA)

N84-19252# Turku Univ. (Finland). Observatory.
THE 70 CM SCHMIDT TELESCOPE OF TURKU UNIVERSITY OBSERVATORY
Tapio Korhonen *In* Helsinki Univ. of Technology Proc. of 16th Finn. Astronomers' Days 1982 p 50-52 (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

A 70 cm Schmidt telescope with mirror and corrector plate the same size was built. This causes a high vignetting of 0.26 mag at the edge of the field. To reduce vignetting in photometric observations a built in diaphragm 62 cm in diameter can be turned out inside the tube near the focus. With the diaphragm the vignetting is 0.10 mag at the edge of the field, and the field free of vignetting is 2.7 deg in diameter. Objective prism dispersion at H is 90 A/mm; spectral resolution is 1.5 to 2A (2 to 3 arcsec) allowing accurate classification of MK stars. The prism can be rotated 180 deg around the optical axis, making radial velocity measurements possible since pairs of stellar spectra with reversed dispersion can be obtained on the same plate.
Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-19253*# National Aeronautics and Space Administration, Washington, D. C.
STELLAR ATMOSPHERIC STRUCTURAL PATTERNS
Richard N. Thomas 1983 394 p refs Prepared in cooperation with CNRS, Paris
(NASA-SP-471; NAS 1.21:471; LC-83-20242) Avail: NTIS HC A17/MF A01 CSCL 03B

The thermodynamics of stellar atmospheres is discussed. Particular attention is given to the relation between theoretical modeling and empirical evidence. The characteristics of distinctive atmospheric regions and their radical structures are discussed. For individual titles, see N84-19254 through N84-19259.

N84-19254*# National Aeronautics and Space Administration, Washington, D. C.
INTRODUCTORY COMMENTS ON STELLAR ATMOSPHERIC STRUCTURE AND ITS MODELING
In its Stellar Atmospheric Struct. Patterns 1983 p 3-18 (For primary document see N84-19253 09-90)
Avail: NTIS HC A17/MF A01 CSCL 03B

A general historical perspective on stellar atmospheric models is presented. Some comments on the priori speculative-theoretical modeling of the star, its atmosphere, and its environment are made. In contrast to this more speculative type of investigation, an empirical-theoretical program is defined. The objectives of the program are to delineate atmospheric structural patterns, properties of the local stellar environment, and some necessary characteristics of subatmospheric structure as inferred from the observations of nonthermal fluxes and phenomena, and thermodynamic self consistency. M.G.

N84-19255*# National Aeronautics and Space Administration, Washington, D. C.
SPECULATIVE-THEORETICAL MODELING OF THE ATMOSPHERE ENVELOPING A HYPOTHETICAL (CLOSED, THERMAL) STAR
In its Stellar Atmospheric Struct. Patterns 1983 p 19-113 (For primary document see N84-19253 09-90)
Avail: NTIS HC A17/MF A01 CSCL 03B

The predictions of theoretical stellar atmospheric structural modeling and the theoretical picture of the local stellar environment as derived from the speculation that stars are (closed, thermal) thermodynamic systems, are summarized. The definition and representation of space- and state-fluxes is discussed and both classical (local thermodynamic equilibrium) and neoclassical (non-local thermodynamic equilibrium) thermal models are addressed. M.G.

N84-19256*# National Aeronautics and Space Administration, Washington, D. C.

EMPIRICAL-THEORETICAL SURVEY OF THE VARIETY OF PECULIARITIES AND ANOMALIES IN THE ATMOSPHERES ENVELOPING ACTUAL STARS

In its Stellar Atmospheric Struct. Patterns 1983 p 115-264 (For primary document see N84-19253 09-90)
Avail: NTIS HC A17/MF A01 CSCL 03B

Phenomena observed in actual stellar atmospheres which contradict the speculative, standard thermal atmospheric model are discussed. Examples of stellar variability, emission line peculiarity, symbiotic stars and phenomena, extended atmosphere stars, superionization, and superthermic velocity are examined. M.G.

N84-19257*# National Aeronautics and Space Administration, Washington, D. C.

CHARACTERISTICS OF DISTINCTIVE REGIONS COMPRISING STELLAR ATMOSPHERES

In its Stellar Atmospheric Struct. Patterns 1983 p 279-322 (For primary document see N84-19253 09-90)
Avail: NTIS HC A17/MF A01 CSCL 03B

Empirically identified atmospheric regions whose existence and properties generally have no classical-theoretical basis are discussed. The quasi-thermal photosphere, chromosphere, lower corona, upper corona, non-decelerated post corona, decelerated post corona, and the H sub alpha emission envelope are defined. The observational phenomena, thermodynamic mechanisms, and diagnostic aspects associated with each of the atmospheric layers are described. M.G.

N84-19258*# National Aeronautics and Space Administration, Washington, D. C.

OBSERVED DISTINCTIVE RADIAL SEQUENCES OF THE DISTINCTIVE ATMOSPHERIC REGIONS COMPRISING STELLAR ATMOSPHERES

In its Stellar Atmospheric Struct. Patterns 1983 p 323-331 (For primary document see N84-19253 09-90)
Avail: NTIS HC A17/MF A01 CSCL 03B

Gross distinctive radial sequences of stellar atmospheric regions are identified and characterized observationally and thermodynamically. Sequences which include quasi-thermal photospheres, ejected shell photospheres, and spherically pulsating photospheres are discussed. M.G.

N84-19259*# National Aeronautics and Space Administration, Washington, D. C.

INFERENCES ON THE THERMODYNAMIC CHARACTERISTICS OF A STAR FROM THE OBSERVED DISTINCTIVE RADIAL SEQUENCES OF THE DISTINCTIVE ATMOSPHERIC REGIONS COMPRISING THAT STELLAR ATMOSPHERE

In its Stellar Atmospheric Struct. Patterns 1983 p 333-349 refs (For primary document see N84-19253 09-90)
Avail: NTIS HC A17/MF A01 CSCL 03B

The implications of observational findings on atmospheric and subatmospheric taxonomy, diagnostics, and modeling are explored. The correlations between distinctive radial sequences in stellar atmospheres and the thermodynamic properties of the stars in which they appear are discussed. M.G.

N84-19260*# California Inst. of Tech., Pasadena. Big Bear Solar Observatory.

CONSEQUENCES OF A CHROMOSPHERIC TEMPERATURE GRADIENT ON THE WIDTH OF H ALPHA IN LATE-TYPE GIANTS

D. M. Zarro Feb. 1984 27 p refs
(Grants NGL-05-002-034; NSF ATM-82-11002)
(NASA-CR-173359; NAS 1.26:173359; BBSO-0230) Avail: NTIS HC A03/MF A01 CSCL 03B

An analytic expression for the integrated H alpha optical depth profile is derived for a one dimensional slab geometry model chromosphere, with electron temperature increasing as a power law with height. The formula predicts H alpha opacity and profile width to be sensitive functions of the thermal gradient. Application of the model to observation reveals that broad H alpha absorption widths in G and K giant stars are consistent with a mean H alpha chromospheric optical depth of 50, while narrower widths in M stars indicate slightly lower opacities. It is proposed that differences in H alpha width between late-type giants of similar spectral type may be due, in part, to differences in their chromospheric thermal gradient, and associated H alpha opacity. Author

N84-19261# Los Alamos Scientific Lab., N. Mex.

CONSTRAINTS ON STELLAR EVOLUTION FROM PULSATIONS

Arthur N. Cox 1983 20 p refs Presented at the IAU Symp. on Observational Tests of Stellar Evolution Theory, Geneva, 12-16 Sep. 1983
(Contract W-7405-eng-36)
(DE84-003787; LA-UR-83-3215; CONF-8309172-5) Avail: NTIS HC A02/MF A01

Consideration of the many types of intrinsic variable stars, that is, those that pulsate, reveals that perhaps a dozen classes can indicate some constraints that affect the results of stellar evolution calculations, or some interpretations of observations. Many of these constraints are not very strong or may not even be well defined yet. In this review the case is discussed for six classes: classical cepheids with their measured Wesselink radii, the observed surface effective temperatures of the known eleven double-mode cepheids, the pulsation periods and measured surface effective temperatures of three R CrB variables, the delta Scuti variable VZ Cnc with a very large ratio of its two observed periods, the nonradial oscillations of our Sun, and the period ratios of the newly discovered double-mode RR Lyrae variables. Unfortunately, the present state of knowledge about the exact compositions; mass loss and its dependence on the mass, radius, luminosity, and composition; and internal mixing processes, as well as sometimes the more basic parameters such as luminosities and surface effective temperatures prevent us from applying strong constraints for every case where currently the possibility exists. DOE

N84-19262# Los Alamos Scientific Lab., N. Mex. Theoretical Div.

SOME INVESTIGATIONS ABOUT THE CARSON OPACITIES

Arthur N. Cox and Russell B. Kidman 1983 6 p refs Presented at the IAU Symp. on Observational Tests of Stellar Evolution Theory, Geneva, 12-16 Sep. 1983
(Contract W-7405-eng-36)
(DE84-003785; LA-UR-83-3216; CONF-8309172-4) Avail: NTIS HC A02/MF A01

Accurate opacities for stellar composition mixtures to stellar structure, evolution, stability, and pulsation are outlined. Three problem areas where increased opacities would be welcome are: the observed broadening of the upper main sequence that can be produced with larger opacities that tend to expand the stars; the existence of the double mode Cepheids and their anomalously low period ratios which can be predicted to be lower, as observed, if opacities are larger; and the small sensitivity of the low mass population 2 horizontal branch liminosity to the metal content of their compositions that would be more effective if their opacity were increased. A possible error in the Carson opacities is proposed, and another that seems to be the correct reconciliation between the Thomas-Fermi and Carson sets is proposed. DOE

N84-19233# Dunsink Observatory, Dublin (Ireland).

STATISTICAL PROBLEMS IN THE DETERMINATION OF THE COSMOLOGICAL DECELERATION PARAMETER QO

T. Kiang *In* ESA Statist. Methods in Astron. Nov. 1983 p 209-213 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

N84-19248# Turku Univ. (Finland).

THE FATE OF THE MAGELLANIC CLOUDS

Mauri Valtonen, Leena Taehtinen, and Kimmo Innanen (York Univ. Canada) *In* Helsinki Univ. of Technology Proc. of 16th Finn. Astronomers' Days 1982 p 33-35 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

N84-19249# Turku Univ. (Finland). Observatory.
ORBITAL ECCENTRICITY IN A LOGARITHMIC POTENTIAL
Kimmo A. Innanen (York Univ., Canada), Leena Taehtinen, and Mauri J. Valtonen *In* Helsinki Univ. of Technology Proc. of 16th Finn. Astronomers' Days 1982 p 36-38 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

N84-19250# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
THE 433 EROS AND 624 HEKTOR. A PHYSICAL MODEL FOR TWO HIGHLY ELONGATED ASTEROIDS
Markku Poutanen *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 41-44 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-19263*# California Univ., Los Angeles. Center for Space Sciences.
SCIENTIFIC PROGRAM IN PLANETARY ATMOSPHERIC STUDIES Final Technical Report, 1 May 1980 - 31 Dec. 1983
A. Lyle Broadfoot (Arizona Univ., Tucson) 31 Dec. 1983 21 p refs
(Grant NAGw-62)
(NASA-CR-175381; NAS 1.26:175381) Avail: NTIS HC A02/MF A01 CSCL 03B

The Voyager encounters with Jupiter led to two main areas of investigation: (1) the definition of the structure and composition of the upper atmosphere and the interaction of the magnetosphere and atmosphere, and (2) the study of the plasma torus using the EUV (Extreme Ultraviolet) data in conjunction with ground-based and in-situ measurements. In the course of these investigations, the atmosphere studies were extended to a comparative study with the bound atmospheres of Saturn and Titan; and the torus study expanded to include the extended atmospheres of Titan (the H torus) and the rings of Saturn. Author

N84-19264*# National Aeronautics and Space Administration, Washington, D. C.
CONSTRUCTION OF A MODEL OF THE VENUS SURFACE AND ITS USE IN PROCESSING RADAR OBSERVATIONS
V. A. Borodin, V. A. Stepanyants, and V. A. Shishov Sep. 1983 18 p refs Transl. into ENGLISH of "Postroyeniye Modeli Poverkhnosti Venery i Yeye Ispolzovaniye pri Obrabotke Radiolokatsionnykh Nablyudeniy" Preprint 20 Moscow, 1983 p 1-19 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77298; NAS 1.15:77298) Avail: NTIS HC A02/MF A01 CSCL 03B

An algorithm is described for constructing the model of the Venus surface as an expansion in spherical functions. The relief expansion coefficients were obtained up to the coefficient S sub 99. The surface picture representation is given according to this expansion. The surface model constructed was used for processing radar observations. The use of the surface model allows improved agreement between the design and measured values of radar ranges. Author

N84-19265# National Aerospace Lab., Tokyo (Japan).
LUNAR EXPLORATION BY POLAR ORBITER
Hajime Koshishi, Koichi Matsushima, Toru Shiho, Atsushi Nakajima, Takeo Kimura, Katsutoshi Saito, and Masato Koyama 1983 81 p refs In JAPANESE; ENGLISH summary
(NAL-TR-755; ISSN-0389-4010) Avail: NTIS HC A05/MF A01

A system study of lunar exploration by polar orbiter is presented and a polar orbiter mission using a remote sensing technique is proposed. The objectives of this mission are to make a complete global survey of the Moon's physical and chemical properties and also develop the technical side of deep space exploration. The global survey of the Moon's surface is very important as the next step in lunar exploration not only from the viewpoint of lunar science but lunar resources as well. This lunar exploration mission will be conducted by a single polar orbiter of 650 kg, launched by the H-IA vehicle, using remote sensing techniques. The chemical and physical mapping of the entire lunar surface by gamma ray spectrometer, fluorescent X-ray spectrometer, reflectance spectrometer, spectrostereo imager and so forth, is expected to provide much information on these subjects. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-19266*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A BALLOON-BORNE HIGH-RESOLUTION SPECTROMETER FOR OBSERVATIONS OF GAMMA-RAY EMISSION FROM SOLAR FLARES
C. J. Crannell, R. Starr (Catholic Univ. of America, Washington, D.C.), A. R. Stottlemyre (Computer Sciences Corp., Silver Spring, Md.), and J. I. Trombka Feb. 1984 46 p refs Submitted for publication
(NASA-TM-86069; NAS 1.15:86069) Avail: NTIS HC A03/MF A01 CSCL 03B

The design, development, and balloon-flight verification of a payload for observations of gamma-ray emission from solar flares are reported. The payload incorporates a high-purity germanium semiconductor detector, standard NIM and CAMAC electronics modules, a thermally stabilized pressure housing, and regulated battery power supplies. The flight system is supported on the ground with interactive data-handling equipment comprised of similar electronics hardware. The modularity and flexibility of the payload, together with the resolution and stability obtained throughout a 30-hour flight, make it readily adaptable for high-sensitivity, long-duration balloon fight applications. Author

N84-19267# California State Univ., Northridge.
A STUDY OF THE MAGNETIC EVOLUTION OF ACTIVE REGIONS AND ITS RELATION TO SOLAR FLARES Final Report, 21 Apr. 1981 - 20 Jul. 1982
G. Chapman 30 Jan. 1983 21 p
(Contract F19628-81-K-0026; AF Proj. 2311)
(AD-A135085; AFGL-TR-82-0302) Avail: NTIS HC A02/MF A01 CSCL 03/2

Observations of solar magnetic fields and associated activity, obtained with a Magnesium b-line (5172 A) Etalon Filter, are described. Particular emphasis is placed on flares visible in the wings of the Magnesium line; such flare structures are of small size (4-6 arcsec) and their intensities are strongly correlated with soft X-ray fluxes. Author (GRA)

N84-19268# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
MEASUREMENTS OF THE SOLAR 160 MIN OSCILLATION AT THE METSAEHOVI RADIO RESEARCH STATION IN 1980-1982 AND COMPARISON WITH THE RESULTS AT THE CRIMEAN ASTROPHYSICAL OBSERVATORY
S. Urpo, H. Teraesranta, N. Holsti, M. Tiuri, V. Kotov, and N. Nesterov 1983 39 p refs
(Rept-S-138; ISBN-951-752-960-0; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

The results of solar 160 min oscillation measurements at

8 mm and 13.5 mm wavelengths are compared with optical and radio observations. Results confirm the existence of this oscillation also at radio frequencies. Author (ESA)

N84-19269# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
IMPROVED COMPUTER PROGRAMS FOR MICROWAVE SUN OBSERVATION AT THE METSAEHOVI RADIO RESEARCH STATION
Niklas Holsti, Seppo Urpo, and Harri Teraesranta 1983 104 p refs
(Rept-S-140; ISBN-951-753-071-4; ISSN-0355-5712) Avail: NTIS HC A06/MF A01

Computer programs for controlling a radio telescope and acquiring the radio power data are presented. Solar (differential) rotation and 1 msec resolution (1000 Hz rate) with continuous data acquisition, or 18 msec (56 kHz rate) in 0.1 sec observation intervals repeated once per second are featured. Program technical structure, and output formats, called BURST and SOSC, are described. Author (ESA)

N84-19270# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. Solar-Terrestrial Physics Div.
SOLAR-GEOPHYSICAL DATA NUMBER 468, AUGUST 1983. PART 1. (PROMPT REPORTS). DATA FOR JULY 1983, JUNE 1983 AND LATE DATA
Helen E. Coffey, ed. and Joe H. Allen 1983 140 p
(PB84-116573; SGD-468-Pt-1; NOAA-83110203) Avail: NTIS HC A07/MF A01 CSCL 03B

IUWDS alert periods (advance and worldwide); solar activity indices; solar flares; solar radio emission; Boulder geomagnetic substorm log; inferred interplanetary magnetic field polarity; mean solar magnetic field; solar active regions; sudden ionospheric disturbances; solar radio spectral observations; cosmic ray measurements by neutron monitor; Geomagnetic indices; and radio propagation indices. GRA

N84-19271# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. Solar-Terrestrial Physics Div.
SOLAR-GEOPHYSICAL DATA NUMBER 468, AUGUST 1983. PART 2. (COMPREHENSIVE REPORTS). DATA FOR FEBRUARY 1983 AND MISCELLANEA
Helen E. Coffey, ed. and Joe H. Allen 1983 33 p
(PB84-116581; SGD-468-PT-2; NOAA-83110204) Avail: NTIS HC A03/MF A01 CSCL 03B

Contents: solar radio bursts at fixed frequencies; solar X-ray radiation from GOES 2; and mass ejections from the Sun. GRA

N84-19272*# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
2ND JOINT SOLAR DYNAMICS PROJECT DATA SUMMARY: SOLAR MAGNETIC FIELD, CHROMOSPHERIC AND CORONAL OBSERVATIONS NEAR THE TIME OF THE 11 JUNE 1983 SOLAR ECLIPSE
D. G. Sime, R. R. Fisher, C. J. Garcia, J. R. Najita, K. A. Rock, P. H. Seagraves, E. A. Yasukawa, M. K. McCabe (Hawaii Univ.), and D. L. Mickey (Hawaii Univ.) Jul. 1983 62 p refs
(Grants NGL-12-001-011; NSF 82-17015)
(NASA-CR-173340; NAS 1.26:173340; PB84-117167; NCAR-TN-213+STR) Avail: NTIS HC A04/MF A01 CSCL 03B

A comprehensive set of observations of the solar photosphere, chromosphere and corona is presented for one week on either side of the 11 June 1983 total solar eclipse. These observations, made at the Mauna Loa Solar Observatory and at the University of Hawaii's Mees Solar Observatory on Haleakala, include H images of the disk and the limb, off-band H sunspot and Ca-II K-line images, together with observations of the white light corona. Photospheric longitudinal magnetic field estimates made from the Fe line at 6302.5 by the Mees observatory Stokes photopolarimeter are included. The data are presented as daily observations. In the case of the k-coronal observations and the magnetic field data, synoptic maps were constructed for this interval. GRA

N84-19273# National Geophysical Data Center, Boulder, Colo.
SOLAR-GOEPHYSICAL DATA NUMBER 469, SEPTEMBER 1983. PART 1: (PROMPT REPORTS. DATA FOR AUGUST 1983, JULY 1983 AND LATE DATA)
Helen E. Coffey, ed. Sep. 1983 124 p 2 Vol.
(PB84-125913; SGD-469-Pt-1; NOAA-83112909) Avail: NTIS HC A06/MF A01 CSCL 03B

Data for August include: IUWDS alert periods (advance and worldwide), solar activity indices, solar flares, solar radio emission, Inferred interplanetary magnetic field polarity, mean solar magnetic field, and Boulder geomagnetic substorm log. Data for July include: solar active regions, sudden ionospheric disturbances, solar radio spectral observation, cosmic ray measurements by neutron monitor, geomagnetic indices, and radio propagation indices. GRA

N84-19274# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 469, SEPTEMBER 1983, PART 2 (COMPREHENSIVE REPORTS). DATA FOR MARCH 1983 AND MISCELLANEA
Helen E. Coffey, ed. Sep. 1983 38 p 2 Vol.
(PB84-125921; SGD-469-PT-2; NOAA-83112910) Avail: NTIS HC A03/MF A01 CSCL 03B

Data for March include solar radio bursts at fixed frequencies; Interplanetary solar particles and plasma; solar X-ray radiation from GOES 2, and mass ejections from the Sun. Miscellaneous data include active regions meudon 29 October-25 November 1982 and synoptic solar maps 29 October-25 November 1982). GRA

N84-18802# Meteorological Satellite Center, Tokyo (Japan).
VISSR OBSERVATION OF THE SOLAR ECLIPSE IN RAPID-INTERVAL LIMITED SCAN MODE
Toshiaki Iwabuchi, Takeji Hoshino, Shuichi Katsuki, and Hiroshi Fujimura *In its* Meteorological Satellite Center Tech. Note, No. 8, 1983 Sep. 1983 p 79-84 refs In JAPANESE; ENGLISH summary (For primary document see N84-18796 09-47)
Avail: NTIS HC A06/MF A01

N84-19187*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NEUTRONS AND GAMMA RAYS FROM SOLAR FLARES
R. Ramaty and R. J. Murphy *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 13 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

N84-19218# Consiglio Nazionale delle Ricerche, Turin (Italy).
THE INFLUENCE OF SOLAR ACTIVITY ON EARTH'S ROTATION: PROBLEMS OF A BIVARIATE ANALYSIS
G. Picchio *In* ESA Statist. Methods in Astron. Nov. 1983 p 125-131 refs (For primary document see N84-19196 09-89)
Avail: NTIS HC A13/MF A01

N84-19246# Helsinki Univ. of Technology, Espoo (Finland).
A HOMOLOGOUS MICROWAVE FLARE ON MAY 29, 1980
Seppo Urpo *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 25-28 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

N84-19247# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
SOLAR ROTATION RATE DETERMINED FROM MILLIMETER DATA
Harri Teraesranta *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 29-32 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-19275# Tufts Univ., Medford, Mass. Dept. of Physics.
BRIGHT, RAPID, HIGHLY POLARIZED RADIO SPIKES FROM THE M DWARF AD LEO Interim Report
K. R. Lang, J. Bookbinder, and L. Golub May 1983 15 p Submitted for publication
(Grant AF-AFOSR-0019-83; AF Proj. 2311)
(AD-A136205; AFOSR-83-1140TR) Avail: NTIS HC A02/MF A01 CSCL 03/2

We have observed a radio burst from the main sequence (dM4.5e) star AD Leo at 1400 MHz from 0536 to 0556 UT on 1983 February 1 at the Arecibo Observatory. A rapid sequence of highly polarized spikes was observed during the gradual rise of a longer lasting, unpolarized event. The maximum flux density of the spikes was S(max) = 130 mJy, and they had rise times less than or approx. 200 ms. The spikes were all 100% left hand circularly polarized with an instrumental uncertainty of 5%. The rise times provide an upper limit to the linear size L less than or approx. 6 x 10 to the 9th power cm for the emitter. Provided that the source is symmetric, it has an area that is less than three hundredths of the star's surface area. In this case, the lower limit to the brightness temperature of the spikes is TB greater than or approx. 10 to the 13th power K. The high brightness temperatures and high degrees of circular polarization are explained in terms of electron-cyclotron maser emission at the second harmonic of the gyrofrequency in longitudinal magnetic fields of strength HI approx. 250 gauss. The unpolarized gradual component did not exhibit any rapid fluctuations, and it was entirely analogous to the thermal emission of solar bursts. Author (GRA)

N84-19276# Department of Energy, New York. Environmental Measurements Lab.
PRODUCTION OF KRYPTON-81 AND KRYPTON-85 BY COSMIC RAYS
Keran OBrien Nov. 1983 17 p refs
(DE84-004439; EML-420) Avail: NTIS HC A02/MF A01

Calculations of the inventory of cosmogenic (81)Kr and (85)Kr were carried out based on the spallation cross sections of Silberbeg and Tsao and on experimental radiative capture cross sections. The resulting production rates were converted to inventories, accounting for variations in solar activity level and in geomagnetic field strength. The results are within about a factor of two of previous estimates. DOE

N84-19188*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY BURSTS: A 1983 OVERVIEW
T. L. Cline *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 10 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

N84-19189*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPECTRAL PROPERTIES OF GAMMA-RAY BURSTS: A REVIEW OF RECENT DEVELOPMENT
B. J. Teegarden *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 15 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

N84-19190*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FREQUENCY OF FAST, NARROW GAMMA-RAY BURSTS AND BURST CLASSIFICATION
J. P. Norris, T. L. Cline, U. D. Desai, and B. J. Teegarden *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 6 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

N84-19192*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPLICATIONS OF THE THREE GRB OPTICAL FLASHES
B. E. Schaefer *In its* Goddard Space Flight Center Contrib. to the Univ. of Calif., Santa Cruz Summer Workshop on High Energy Transients Oct. 1983 3 p refs (For primary document see N84-19186 09-88)
Avail: NTIS HC A04/MF A01 CSCL 03B

N84-19244# Helsinki Univ. of Technology, Espoo (Finland). Observatory and Astrophysics Lab.
DERIVATION OF THE PROPERTIES OF THE COSMIC BACKGROUND RADIATION FROM A STATIC WORLD MODEL
Toivo Jaakola *In its* Proc. of 16th Finn. Astronomers' Days 1982 p 14-17 refs (For primary document see N84-19241 09-89)
Avail: NTIS HC A04/MF A01

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N84-19277*# National Aeronautics and Space Administration, Washington, D. C.
WITH A VIEW TO THEIR PRACTICAL SOLUTION: SIXTY YEARS WITH NACA AND NASA, 1915 - 1976
Eugene M. Emme 9 Feb. 1976 28 p refs Presented at Winter Colloq. Series, Hampton, Va.
(NASA-TM-85555; NAS 1.15:85555) Avail: NTIS HC A03/MF A01 CSCL 01B

The history of the National Advisory Committee for Aeronautics and the National Aeronautics and Space Administration is examined. N.W.

N84-19278# California Univ., Berkeley. Lawrence Berkeley Lab.
PHYSICS, COMPUTER SCIENCE AND MATHEMATICS DIVISION Annual Report, 1 Jan. - 31 Dec. 1982
J. D. Jackson Aug. 1983 83 p
(Contract DE-AC03-76SF-00098)
(DE84-003915; LBL-16140) Avail: NTIS HC A05/MF A01

Experimental physics research activities are described under the following headings: research on e()e(*) annihilation; research at Fermilab; search for effects of a right handed gauge boson; the particle data center; high energy astrophysics and interdisciplinary experiments; detector and other research and development; publications and reports of other research; computation and communication; and engineering, evaluation, and support operations. Theoretical particle physics research and heavy ion fusion research are described. DOE

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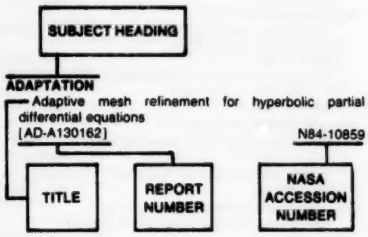
Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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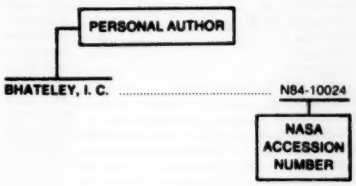

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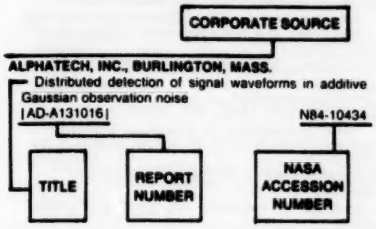

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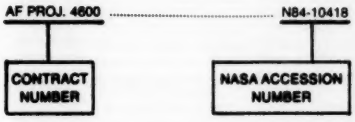

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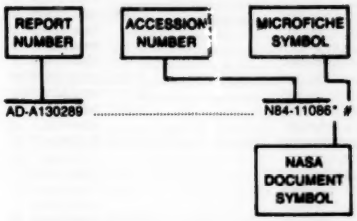

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